

# White Paper

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## White Paper Report

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Project Directors: Erin Walcek Averett, Jody Gordon, Derek Counts

Grantee Institution: Creighton University

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### **Abstract**

The award of this NEH Digital Humanities Start-Up Level I Grant in 2015 (\$27,277) (Award # HD-51851-14) supported a two-day workshop at Wentworth Institute of Technology, Boston, whose primary goal was to bring together pioneers in digital practice in archaeology to discuss the creation, use, and implementation of mobile tablet technology in archaeology. The themes of the workshop sessions and discussions aimed to showcase the impact of these technologies at the level of field practice as well as analysis, interpretation, and dissemination. The workshop was successful in synthesizing current trends, highlighting best practices, but also in shining a light on both positive and negative implications for the rather swift adoption of mobile technologies.

The deliverables for the grant include the peer-reviewed, open access publication of the proceedings with expert responses (*Mobilizing the Past for a Digital Future: The Potential of Digital Archaeology*, published under a Creative Commons By Attribution 4.0 license by The Digital Press at University of North Dakota: <https://thedigitalpress.org/mobilizing-the-past-for-a-digital-future/>), supplemental digital materials, including videos of the workshop (through The Digital Press website, hosted by Mukurtu), and this white paper. As the project results suggest, a relatively modest investment by the NEH has resulted in significant benefit to ongoing discussions on the current state and future of digital archaeology, and has mapped a path forward to continuing this critical engagement in the future.

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## I. Introduction & Background

Our workshop idea was spearheaded by the grant team under the aegis of the Athienou Archaeological Project (AAP), one of the forerunners in utilizing mobile computing in field archaeology in the Mediterranean.<sup>1</sup> AAP began experimenting with the use of Apple iPad tablet computers during excavations at the site of Athienou on Cyprus in 2011, and has since developed protocols for their use in field data recording, processing, and born-digital archiving.<sup>2</sup> In 2011, AAP was one of the few projects experimenting with this new technology; yet between that time and when we applied for our NEH grant in 2014, several projects had engaged in an intense phase of experimentation with new tablet devices, and had begun to recognize how their use was transforming archaeological practices in significant ways. Reflecting on this atmosphere of scholarly and technological change, we felt that the time was ripe for an in-depth dialogue to establish best practices that might encourage and inform other archaeological projects' engagement with mobile computing in digital archaeology. Moreover, we recognized that the



*Supervisor at the Athienou Archaeological project using iPad to record the digital trench notebook, 2016.*

broader implications for archiving, research, interpretation, and dissemination of archaeological data needed more rigorous critique. As a result, we proposed the “Mobilizing the Past” workshop as a forum to bring together scholars who were grappling with how best to deploy mobile technology and navigate the burgeoning field of digital archaeology, which we define as “the use of computerized—especially internet connected and portable—tools and systems aimed at facilitating the documentation, interpretation, and publication of material culture.” Based on

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<sup>1</sup> AAP (<http://aap.toumazou.org/>) combines systematic survey and excavation with an eight-week undergraduate field school. Founded in 1990 by Michael Toumazou, the project has received generous funding for the field school through the National Science Foundation – Research Experience for Undergraduates Sites program for 10 seasons (SBR-942165 [1995], SBR-9619760 [1997], SBR-9732407 [1998], SES-9820549 [1999-2002], SES-0354003 [2004-2007], and SMA-1156968 [2012-2014]).

<sup>2</sup> See Toumazou et al. 2015. “Shedding Light on the Cypriot Rural Landscape: Investigations of the Athienou Archaeological Project in the Malloura Valley, Cyprus, 2011-2013,” *Journal of Field Archaeology* 40: 204-20; Gordon et al. 2016. “DIY Digital Workflows on the Athienou Archaeological Project, Cyprus,” in *Mobilizing the Past for a Digital Future: The Potential of Digital Archaeology*, edited by Averett, Gordon, and Counts. Grand Forks: The Digital Press, The University of North Dakota; see also AAP iPad protocols: <https://mobilizingthepast.mukurtu.net/digital-heritage/14-diy-digital-workflows-athienou-archaeological-project-cyprus-supplemental>.

our experiences with mobile computers in the field, the grant team recognized that new, and theoretically reflexive, digital approaches to archaeology could not only shed new light on the study of past societies, but also potentially impact the broader humanities through pioneering modes of mobile data collection, analysis, and open-access dissemination.

Over the last fifteen years, mobile computing technology has shaped global society in unprecedented ways. By the mid-2000s, the first smart phones were introduced, and by 2010, the first multi-functional and highly portable tablet computers entered the consumer market. Apple Corp. led the way with its now iconic iPad on the iOS operating system; however, this pioneering device was soon joined by a host of other mobile computing devices such as Microsoft Surfaces, Samsung Galaxy Tabs, and Google Nexuses.

Archaeology has long experimented with computers for data collection to collate and organize large, quantitative datasets in laboratory settings. Yet, collecting this data at the trowel's edge was always more difficult—even with laptop computers—due to the harsh environmental conditions of archaeological sites and the multi-tasking requirements of archaeological recording methods. With the advent of highly portable tablet computers with wireless connectivity, long-battery lives, and durable, industrial designs, the stage was set for a revolution in archaeological practice. In 2010, archaeological projects, such as the Pompeii Archaeological Project: Porta Stabia (PARP:PS), began to take tablets to the trenches for the first time and to blog about how the use of new mobile technology had provided them with new, and more efficient, modes of collecting and analyzing archaeological field data. Using tablet computers, archaeologists could now excavate their trenches and record notes, measurements, take digital images and videos, consult text documents such as field manuals, past notebooks, and academic literature, and upload this born-digital data into databases, sometimes even wirelessly from the trenchside.

Following the lead of PARP:PS and other experimental projects, the Athienou Archaeological Project initiated four experimental seasons of iPad use on our site in Cyprus. From 2011-2015, trench supervisors utilized iPads to record archaeological data in a new, almost completely paperless way. Based on our experiences during the first two years, learning how to use the devices, developing protocols and data workflows, and teaching our staff how best to excavate with digital aids (detailed in our project's chapter in *Mobilizing the Past*), we felt that the time was right to share our experiences with other projects and learn from them as well. Although other venues (e.g., Computer Applications in Archaeology, and the Society for American Archaeology) had offered preliminary panels on these topics, no panel had holistically brought together a diverse range of scholars working in different regions and

time periods to discuss the immediate impacts of mobile computing in archaeology in practical and theoretical terms in sustained discussion. In such a context of the rapid implementation of new forms of mobile technology within archaeological practice, the idea for the “Mobilizing the Past” workshop was born.

## **II. The Workshop**

Our successful NEH Digital Humanities Start-Up grant resulted in the organization of a national two-day workshop held at Wentworth Institute of Technology in Boston. Wentworth was the ideal academic setting for such a conference because of this STEM school’s emphasis on the foundations and potential of emergent technologies as well as their application to the social sciences. A workshop devoted solely to the topic of discussing the adoption, use, and broader implication of mobile computing in archaeology (the first of its kind) was preferable to organizing sessions at academic conferences since the format allowed us to focus on in-depth coverage and discussion, and provided an ideal opportunity to produce accessible resources and promote meaningful, multidimensional and multidisciplinary discussion in a way that is not typically possible with discipline-specific conference sessions. By bringing together archaeologists and technology specialists from diverse disciplines, who often do not work in the same geographical area, this workshop helped build a dialogue across disciplines and regions, promoting an ongoing rigorous discussion about the future of mobile computing in archaeology. In addition, such broad and interconnected discourses were enhanced by the livestreaming of the workshop proceedings via Wentworth’s UStream site (<http://www.ustream.tv/channel/wentworth-institute-of-technology>), and through the various real-time discussions that occurred on Twitter between users across the USA and the further abroad. The workshop program and paper abstracts are included in Appendix A, while the digital videos of the individual papers are archived at Mukurtu.net by the Center for Digital Archaeology (accessible from The Digital Press at University of North Dakota’s website: <https://thedigitalpress.org/mobilizing-the-past-for-a-digital-future/>). The workshop included five sessions on App/Database development; Mobile Computing in the Field; Systems for Archaeological Data Management and Pedagogy, Data Curation; and Reflection. We additionally had a lively round table session and high-profile keynote and plenary lecturers to open and close the workshop (the final program can be found here: <http://uwm.edu/mobilizing-the-past/final-program/>).

The workshop was well attended, with 75 registrants and approximately 100 people total in attendance at the event. We also worked to create an active backchannel to ensure that our workshop had a broader reach. The statistics for our social media engagement can be found in Appendix C.

The event was additionally livestreamed by Wentworth, and now archived on the Wentworth YouTube channel (<https://www.youtube.com/watch?v=90trbnBOslQ>). As of January 15, 2017, the total YouTube views for the workshop videos are:

- Day 1, Part 1: 464 views
- Day 1, Part 2: 285 views
- Day 2, Part 1: 213 views
- Day 2, Part 2: 233 views
- Day 2, Part 3: 223 views
- Day 2, Part 4: 110 views

The following chart documents the number of concurrent views for each of the workshop sessions on the Wentworth UStream Channel:

2/27/15 14:00	15
2/27/15 15:00	50
2/27/15 16:00	47
2/27/15 17:00	41
2/27/15 18:00	22
2/28/15 8:00	23
2/28/15 9:00	30
2/28/15 10:00	31
2/28/15 11:00	40
2/28/15 12:00	42
2/28/15 13:00	35
2/28/15 14:00	34
2/28/15 15:00	33
2/28/15 16:00	28
2/28/15 17:00	24
2/28/15 18:00	19
2/28/15 19:00	14

The total views for the livestream were 223 for the first day of the workshop (Feb. 27, 2015) and 142 for the second day, Feb. 28. The viewing locations were diverse and global:

Location	Views
US	390
US-MA	64
US-OH	37

US-NY	37
US-TX	36
US-CO	22
US-VA	20
US-CA	19
US-CT	19
US-WA	19
US-MN	18
US-AZ	10
US-TN	9
US-NV	9
US-SC	9
US-FL	8
US-NJ	7
US-RI	6
US-IL	6
US-ND	6
US-PA	4
US-NC	4
US-WI	4
US-DC	4
US-DE	3
US-OK	3
US-MS	2
US-MI	1
US-ME	1
US-AR	1
US-MO	1
US-UT	1
ES	34
GR	29
BE	25
CY	16
CA	15
PE	12
IL	11
GB	9
IT	7
TR	5

PS	2
DE	2
AU	1
JP	1
FR	1
DK	1
MA	1
SE	1
EG	1
GT	1

The videos of presenters, who also published revised papers for the publication, were also archived as part of the supplemental content of the *Mobilizing the Past* volume (which can now be viewed as part of the supplemental material of the publication (<https://thedigitalpress.org/mobilizing-the-past-for-a-digital-future/>)).

In terms of promotion and publicity, we created a website (<http://uwm.edu/mobilizing-the-past/>) and social media sites (Twitter and Facebook) for the workshop to post the schedule, practical information. There were also several blog posts and feature news stories before and after our workshop:

<https://mediterraneanworld.wordpress.com/2014/12/16/mobilizing-the-past-for-a-digital-future-a-digital-archaeology-workshop/>  
<https://mediterraneanworld.wordpress.com/2015/03/02/mobilizing-the-past-workshop-review/>  
<https://mediterraneanworld.wordpress.com/2015/03/03/mobilizing-the-past-workshop-review-part-2/>  
<http://www.wit.edu/features/2015/02/2015-02-13.html>  
<http://www.wit.edu/news/2015/03/2015-03-05.html>  
<http://ancientworldonline.blogspot.com/2015/02/live-streamed-conference-mobilizing.html>  
<http://codifi.org/project/mobilizing-the-past-for-a-digital-future/>  
<http://www.classicslibrarians.org/?cat=3>  
<http://paperlessarchaeology.com/2015/01/31/mobilizing-the-past/>  
<http://paperlessarchaeology.com/2015/03/03/mobilizing-the-past-workshop-videos/>  
<http://archaeologynewsnetwork.blogspot.com/2014/09/digital-archaeology-changes-exploration.html#.VSw1BkuRNg0>  
<http://codifi.org/project/mobilizing-the-past-for-a-digital-future/>  
<http://www.diachronicdesign.com/blog/2015/02/28/15-mobilizing-the-past-for-the-digital-future-conference-day-1-roundup/>  
<https://networks.h-net.org/node/14775/discussions/148153/mobilizing-past-digital-future>  
<http://www.creighton.edu/publicrelations/newscenter/news/2016/october2016/october312016/erinaverettbooknr103116/>  
<http://www.openaccessweek.org/profiles/blogs/a-new-open-access-book-mobilizing-the-past-for-a-digital-future>  
<https://mediterraneanworld.wordpress.com/2016/10/24/new-book-from-the-digital-press-mobilizing-the-past-for-a-digital-future/>  
<http://uwm.edu/news/book-excerpt-modern-day-tools-help-probe-our-distant-past-digital-archaeology/>

It is clear that our workshop and its published results not only proved to be an intellectually stimulating experience for the archaeologists and audience who were able to attend in person, but it also showed that scholars from across the US and around the world tuned in to hear about the most recent developments in digital archaeology. This demonstrates that the topic was extremely timely and that we succeeded in getting across some of the most important technological developments and methodological problems confronting digital archaeology to a wide range of people.

### III. Institutional and Individual Participants

The four collaborating institutions for this project and their respective contributions are:

- Creighton University, Omaha, NE
  - o Administrative institution for this grant
  - o Provided financial and logistical support for the workshop and publication
- Wentworth Institute of Technology, Boston, MA
  - o Host institution for workshop
  - o Provided financial and logistical support for the workshop
- University of Wisconsin-Milwaukee, Milwaukee, WI
  - o Provided financial and logistical support for the workshop
  - o Hosted workshop website (<http://uwm.edu/mobilizing-the-past/>)
  - o Provided institutional support and hosting for publication on Digital Commons
- Davidson College, Davidson, NC
  - o Provided financial support for the workshop

The principal investigators each provided key roles in designing, planning, and implementing the project workshop and final products:

- **Erin Walcek Averett, Ph.D.** is Associate Professor of Archaeology in the Department of Fine and Performing Arts and Classical and Near Eastern Studies at Creighton University. She serves as the Assistant Director of the Athienou Archaeological Project (AAP) on Cyprus, where she has been excavating since 1997. She specializes in the art and archaeology of Greece and Cyprus, with special focus on terracotta figurines and Iron Age religion in the Eastern Mediterranean. Her research area additionally includes 3D imaging and digital tools in archaeology, with a specific interest in 3D artifact models for research and publication. She has

recently published articles on Cypriot masks and the AAP 3D imaging project in the *American Journal of Archaeology and Antiquity*.

- **Jody Michael Gordon, Ph.D.**, is an Assistant Professor of Humanities and Social Sciences at Wentworth Institute of Technology in Boston and an Assistant Director of the Athienou Archaeological Project (AAP). He received his Ph.D. in Classical Archaeology from the Department of Classics at the University of Cincinnati, where his dissertation involved an archaeological study of the effects of imperialism on local identities in Cyprus during the Hellenistic and Roman periods. In addition to working in Cyprus, Jody has excavated in Tunisia, Italy, and Greece, and his research interests include Roman archaeology, cultural identity, ancient imperialism, and computer applications in archaeology.
- **Derek B. Counts, Ph.D.**, is Professor and Chair in the Department of Art History at the University of Wisconsin-Milwaukee. He has published extensively on the archaeology of Iron Age Cyprus, with an emphasis on Cypriot religion, as well as limestone votive sculpture and its associated iconography. His research interests also include 3D visualization in archaeology and its impact on interpretation and publication. He is Associate Director of the Athienou Archaeological Project (AAP), where he has been excavating for more than two decades. Recent books include *The Master of Animals in Old World Iconography* (2010, co-edited with Bettina Arnold) and *Crossroads and Boundaries: The Archaeology of Past and Present in the Malloura Valley* (2011, co-edited with AAP colleagues).

In addition, the workshop supported a platform for leaders in the field of digital archaeology to come together and present their work and engage in critical and collective dialogue. The workshop participants are included in the Workshop Program (Appendix A).

#### **IV. Project Outcomes & Deliverables**

The primary goals of the “Mobilizing the Past” workshop were:

1. to document the “state of the field” of the use of mobile technology in archaeology
2. to engage in critical thinking and discussion on the broader implications of the growing use of such technologies on our interpretation of the past and discipline as a whole

3. to make the results of our workshop and discussions openly available in a timely manner

In addition to the livestreamed and recorded digital video of the workshop papers, the workshop's primary deliverable is a peer reviewed, open-access, digital and print-on-demand edited volume (published under a Creative Commons By Attribution 4.0 license by The Digital Press at University of North Dakota) that further developed and refined many of the participants' key ideas based on dialogue at the workshop and peer and editorial review. The book, *Mobilizing the Past for a Digital Future: The Potential of Digital Archaeology*, consolidated and developed the workshop's chief ideas and debates. At present, the book *in toto* has been downloaded over 1000 times, including 580 times from The Digital Press @ UND site, 302 times from the editors' Academia.edu sites, and 143 times from the UWM Digital Commons site (762 total downloads from Digital Commons, including individual chapters); chapters have also been downloaded from various authors' Academia.edu and personal research pages. The impact of this work has been truly global (for example, analytics from bepress's Digital Commons records downloads from 131 institutions in 54 countries; Academia.edu analytics reveals a similar global reach). The following is a synopsis of the book content written by the publisher, William Caraher at the University of North Dakota Digital Press:

“Mobilizing the Past is a collection of 20 articles that explore the use and impact of mobile digital technology in archaeological field practice. The detailed case studies present in this volume range from drones in the Andes to iPads at Pompeii, digital workflows in the American Southwest, and examples of how bespoke, DIY, and commercial software provide solutions and craft novel challenges for field archaeologists. The range of projects and contexts ensures that *Mobilizing the Past for a Digital Future* is far more than a state-of-the-field manual or technical handbook. Instead, the contributors embrace the growing spirit of critique present in digital archaeology. This critical edge, backed by real projects, systems, and experiences, gives the book lasting value as both a glimpse into present practices as well as the anxieties and enthusiasm associated with the most recent generation of mobile digital tools.

This book emerged from a workshop funded by the National Endowment for the Humanities held in 2015 at Wentworth Institute of Technology in Boston. The workshop brought together over 20 leading practitioners of digital archaeology in the U.S. for a weekend of conversation. The papers in this volume reflect the discussions at this workshop with significant additional

content. Starting with an expansive introduction and concluding with a series of reflective papers, this volume illustrates how tablets, connectivity, sophisticated software, and powerful computers have transformed field practices and offer potential for a radically transformed discipline.

Edited by Erin Walcek Averett, Jody Michael Gordon, and Derek B. Counts

With additional contributions by Rebecca Bria, Bridget Buxton, William Caraher, J. Andrew Dufton, Steven J. R. Ellis, Samuel B. Fee, Shawn Fehrenbach, Eric C. Kansa, Morag M. Kersel, Marcelo Castro López, Christopher F. Motz, Brandon R. Olson, Eric E. Poehler, Adam Rabinowitz, Ted Roberts, Shawn Ross, Matthew Sayre, Adela Sobotkova, Matthew Spigelman, John Wallrodt, and Steven Wernke.”

We received additional funding and support from Creighton University, The University of Wisconsin-Milwaukee, and The Digital Press at The University of North Dakota for the timely, open, and dynamic publication of our results.

The publication of *Mobilizing the Past* also resulted in the following papers and online pieces: “Mobilizing the Past: Mobile Computing and Digital Workflows in Near Eastern Archaeology and Beyond—A Review of Current Developments.” Paper delivered at the American Schools of Oriental Research Annual Meeting, November 2016.

([https://www.academia.edu/30050779/Mobilizing\\_the\\_Past\\_Mobile\\_Computing\\_and\\_Digital\\_Workflows\\_in\\_Near\\_Eastern\\_Archaeology\\_and\\_Beyond\\_A\\_Review\\_of\\_Current\\_Developments\\_Paper\\_delivered\\_at\\_the\\_ASOR\\_Annual\\_Meeting\\_2016\\_San\\_Antonio\\_TX](https://www.academia.edu/30050779/Mobilizing_the_Past_Mobile_Computing_and_Digital_Workflows_in_Near_Eastern_Archaeology_and_Beyond_A_Review_of_Current_Developments_Paper_delivered_at_the_ASOR_Annual_Meeting_2016_San_Antonio_TX) )

<https://www.wit.edu/news/uncovering-past-examining-future-archaeology>

<https://archaeologynewsnetwork.blogspot.pt/2016/11/modern-day-tools-help-probe-our-distant.html#MseuhPRImCo6B3JS.97>

[http://www.omaha.com/go/books/bookends-books-of-local-interest/article\\_1d419a44-3324-5ccd-83cc-c0a223cd228f.html](http://www.omaha.com/go/books/bookends-books-of-local-interest/article_1d419a44-3324-5ccd-83cc-c0a223cd228f.html)

[http://www.creighton.edu/publicrelations/newscenter/news/2016/october2016/october312016/erinaverettbooknr103116/?utm\\_medium=social&utm\\_source=twitter&utm\\_campaign=november](http://www.creighton.edu/publicrelations/newscenter/news/2016/october2016/october312016/erinaverettbooknr103116/?utm_medium=social&utm_source=twitter&utm_campaign=november)

<http://www.forbes.com/sites/drsarahbond/2016/10/28/digital-archaeology-digest-biblical-manuscripts-handheld-sundials-and-3d-byzantine-shipwrecks/#4eeb5e9ed3eb>

<https://electricarchaeology.ca/2016/10/08/distantly-reading-digital-archaeology-mobilizing-the-past-for-a-digital-future/>

<https://corinthianmatters.com/2016/10/25/mobilizing-the-past-for-a-digital-future/>

<http://blogs.und.edu/uletter/2016/10/the-digital-press-at-und-celebrates-open-access-week-by-publishing-mobilizing-the-past-for-a-digital-future/>

<http://digitalhumanitiesnow.org/2016/10/distantly-reading-digital-archaeology-mobilizing-the-past-for-a-digital-future/>

<http://uwm.edu/news/book-excerpt-modern-day-tools-help-probe-our-distant-past-digital-archaeology/>

## **V. General Conclusions and Next Steps**

Since the mid-2000s, the increased influence of multitasking and portable technologies on society and the enhanced interconnectivity that comes with them has revolutionized the ways that many humanities scholars collect, analyze, and disseminate their data. The “Mobilizing the Past” workshop has illustrated that archaeology, a humanities/social science discipline that interprets the remains of past societies to understand our own better, has also been affected by these accelerated methodological transformations. The workshop brought together archaeologists working in several phases of the burgeoning digital archaeological process to share their ideas on what was working, failing, or could be done better within a time of fast technological and epistemological change. However, the diverse array of participants also illustrated that there is no one “best” way to practice digital archaeology; rather, practice depends on factors such as access to funding, technical staff, as well as a specific project’s scholarly goals. Indeed, some participants surprisingly extolled the continuing virtues of paper. Overall, diversity, experimentation, and new views on the past were all hallmarks of this dynamic workshop. Luckily, the livestream videos and our peer-reviewed open-access edited volume, *Mobilizing the Past for a Digital Future*, have preserved this conversation so that they can be marshaled to inform future scholars when we face new ethical and practical challenges related to the influences of new technologies on our discipline.

The workshop showed that even over the short-term, new technologies (and especially those that scaffold portable and internet-connected devices) have the power to compel archaeologists to reconsider how the tools and methods they employ can have a significant impact on how we understand the past. For our participants, such changes were immediately noticeable at the edge of the trench, the primary locus where data is collected, as paper context sheets and daily diaries that record archaeological data in the soil and the excavator’s methods were converted to digital forms. Such recording was made possible after 2010 using tablet computers, which, according to our participants,

greatly accelerated how much written and visual information could be recorded, while also showing that some aspects, such as digital drawings, were more difficult to capture without a traditional pen and pencil. Great strides were also made with the use of UAVs and submersible rovers, equipped with advanced digital cameras to collect primary archaeological datasets. Indeed, these devices seem to provide massive amounts of relatively accurate coordinates that can—when manipulated within a GIS or modeling program—render geometrically accurate point clouds of road systems, sites, trenches, and individual artifacts, in both two and three dimensions. The ability to transport 3D artifact scans digitally and to reproduce artifacts with 3D printing technology allows artifacts to be printed in a range of materials enhancing the possibilities for post-excavation analysis in places far from the museums that house the originals.

Our workshop participants also engaged in discussions about what happens to the digital data, including artifact images, trench measurements and drawings, and personal observations about the trench *after* the data is collected. The internet capability of portable devices makes it possible to upload data to online databases in real time, and query such datasets to help make informed decisions *in* the field. Moreover, several members of an archaeological team can access this data simultaneously and add their interpretive views as part of the process, making archaeology a more democratic and potentially interdisciplinary undertaking. For example, an excavator can find, measure, photograph and describe an artifact (such as a particular style of pot), upload this information to the database, and then an expert in the lab could identify the type and thus help the excavator make informed decisions about where and how to dig next. Other large datasets could be marshaled (even using algorithms) to show trends in the archaeological record. Despite the potential of the near real-time sharing and analyzing of data, some participants cautioned that it is important to examine *who* is in charge of maintaining such digital workflows and monitoring access to archaeological databases. Institutional and project power structures can still limit digital archaeology's democratic potential.

Another series of issues that arose at the workshop involved the publication and dissemination of born-digital archaeological data. Discussions focused on the best modes of publishing data, especially online, and the ethical issues that surround making data open access. Also at stake were larger structural issues dealing with how digital publishing and long-term archiving projects like Open Context, Mukurtu, or tDAR can sustain business models that are both academically and ethically rigorous, while also managing access for stakeholder communities that consume the archaeological data. In general, participants preferred academically-curated, yet open access, publishing models supported by funding models that respect intellectual independence and sliding scales of user fees. Archaeological ethics, in

terms of publishing excavated materials and user-access, were at the forefront of these discussions, as were the realistic factors of supporting a non-profit online repository service within a U.S. university system tinged with neoliberal economic perspectives that are often obsessed with innovation and tangible results.

For all the apparent successes that the workshop identified in terms of how data collection and analysis has improved via mobile computing workflows, the participants also highlighted that such changes also affected the way scholars practice archaeology. First, most participants agreed that the introduction of tablets at trench side caused archaeologists to make different decisions about where and how to excavate. Sometimes these decisions were more informed; at other times they may resulted in data that simply complicated interpretation without adding substantially new knowledge. Another issue was that although data collection could be done faster with a multitasking device, the improved efficiency did not always convert into useful trench analysis, but instead was devoted to simply collecting more data and introduced a 'more' vs. 'better' data conundrum. In addition, several scholars lamented the fact that the increased speed of data collection, especially through methods involving photogrammetry and structure-from-motion techniques (which in some cases completely eliminated the traditional skill of paper-based trench illustration), caused archaeologists to disconnect with the material under study and to leave little time for a measured contemplation of the data in situ. Questions about whether archaeologists were losing traditional skills (such as drawing) or becoming too disconnected from archaeological contexts resulted in a call for a *slower* approach to archaeological practice that did not eschew digital methods, but advocated a reflexive and deliberative approach to their use.

In general, "Mobilizing the Past" brought together a diverse range of voices in digital archaeology to take stock of its successes and perceived problems. As discussed above, all stages of the archaeological process that have recently been affected by the shift to mobile, connected, and digital methods were addressed, and most participants agreed that it is important to move forward with a digital archaeology that is both practical and especially ethical. Such a perspective was particularly well articulated in the responses to the *Mobilizing the Past for a Digital Future* volume wherein Morag Kersel and Adam Rabinowitz took stock of our results, but also outlined where the discipline should go in future. These scholars provided insightful overviews of the results of the conference and suggested that, based on the main themes that emerged from discussion, the digital and mobilized archaeology of the future should not ignore its successes, but at the same time should be a reflexive and critical pursuit that moves toward integrating both progress and critique. Thus, overall, the workshop put existing practices in digital archaeology under a critical lens, and permitted particularly thoughtful and reflexive approaches

to the application of technology to data collection, analysis, and interpretation to come to the fore. Based on the fact that the workshop proceedings have been widely disseminated in an open access and archival format, it is hoped that the perspectives created from “Mobilizing the Past” will influence future attempts to introduce new technologies not only to the practice of archaeology, but also to related social scientific disciplines engaged in data collection in the field, such as anthropology, sociology, or economics.

“Mobilizing the Past” was a workshop that took the pulse of digital archaeology in 2015. Through its livestream and open access online publication, it disseminated the workshop’s ideas on a global level by the end of 2016. It did not go into depth on every aspect of digital archaeological practice as is possible at large-scale conferences, such as the Computer Applications in Archaeology Annual Meeting. However, it did permit a range of intimate conversations about how technology affects archaeological practice that need to be continued in the immediate future.

In terms of next steps for developing and testing concepts developed at “Mobilizing the Past” there are avenues for further research and themes in digital archaeology that should be pursued. First, the grant team will continue their work on the efficacy of digital methods both at the Athienou Archaeological Project, but also in their further research on linked open data archaeological publishing (Counts and Averett), 3D modeling (Counts and Averett), and the measurement of how digital devices enhance archaeological productivity (Gordon).

Second, future workshops should be held at institutions that are willing to continue many of the discussions initiated at “Mobilizing the Past.” Such dialogues, both in-person and online, will be needed to keep up with the rapid rate of change that is occurring as new technologies are applied to humanities research, and such developments are showing no sign of abating. One excellent example of such a workshop was the Michigan State University Digital Archaeological Institutes (MSU DAI) held during the summers of 2015 and 2016. These events (which were also livestreamed) further developed many of the issues confronted at “Mobilizing the Past” and also resulted in the creation of a new online hub for the discussion of digital archaeology, the Digital Archaeology Commons (<http://commons.digitalarchaeology.msu.edu/>). Online discussions and the sharing of open access documents pertaining to digital archaeology and the influence of mobile computing would be particularly useful. Another outlet for continuing discussion online might be in the burgeoning Humanities Commons website (<https://hcommons.org/>). Many of the participants in “Mobilizing the Past” are also actively engaged in these workshops on online discussions, and so the future looks bright for the establishment of online, social communities debating digital archaeology.

A third important avenue for future work would be the continued analysis of specific salient themes in digital archaeology that arose from the workshop. These topics are fundamental to the archaeological discipline and have been placed under stress since the application of mobile digital methodologies:

- Deskillling archaeological practices
- Dealing with a data deluge resulting from born-digital data recording
- The ethics and practicality of open-access, online publication
- The issue of data archiving, storage, and metadata standards
- The need to slow down accelerated digital practices to increase interpretive quality; the further definition of “slow” digital archaeologies
- The need to better utilize “saved” time
- Expanding digital archaeological practice to include under-represented groups
- The use of digital surrogates for archaeological analysis
- The pedagogical value of digital archaeological processes
- Measuring productivity in the digital archaeological process
- Analyzing democratic collaboration in digital archaeology
- The annual reviewing of emergent digital tools and their impact on practice
- The future of digital archaeology in the realms of robotics, artificial intelligence, and virtual reality.

In sum, the grant team feels that the “Mobilizing the Past” workshop and subsequent publication has contributed to the establishment of some of the key discussion questions pertaining to the future of mobilized, digital archaeology. The team would like to thank the NEH for supporting the workshop’s aims and would encourage it to continue its support of digital archaeological endeavors moving forward. Digital archaeological practices have great potential to help scholars better understand humanity’s past as long as they are implemented in a reflexive and ethical fashion. If such initiatives are supported in future, both financially and in the name of the public good, archaeologists may learn new information about the past that will help citizens navigate the vital issues facing America today, including demographic change, globalization, and social inequality.

## Appendix A: Mobilizing the Past Workshop Program

*Mobilizing the Past for a Digital Future: the Potential of Digital Archaeology*  
**Workshop Program**

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### **WORKSHOP ORGANIZERS**

Erin Walcek Averett, Creighton University (Omaha, NE)  
Jody M. Gordon, Wentworth Institute of Technology (Boston, MA)  
Derek B. Counts, University of Wisconsin-Milwaukee (Milwaukee, WI)  
Michael K. Toumazou, Davidson College (Davidson, NC)

### **SPONSORS**

Digital Humanities Start-Up Grant, National Endowment for the Humanities  
Creighton University  
Wentworth Institute of Technology  
Davidson College  
University of Wisconsin-Milwaukee

### **DATES**

27-28 February 2015

### **WORKSHOP AGENDA**

This workshop focuses on the emergence of digital archaeology – fully digital recording systems to create born-digital data in the field. The purpose of this intensive workshop is to bring together the leading figures in the field to discuss the use, creation, and implementation of mobile technology in advancing digital archaeology. Session themes are aimed to facilitate presentation and discussion on how archaeologists from different disciplines are using tablets or similar digital tools in the field, in the lab, and beyond, and how best practices are emerging and might be implemented across projects of different scale. The workshop will highlight the advantages and future of mobile computing as well as its challenges and limitations.

### **PROGRAM**

All events are hosted on the campus of Wentworth Institute of Technology (WIT) unless otherwise noted.

#### **DAY I**

#### **February 27**

1:00 – 5:00 pm	<b>Registration</b> , Alumni Room, Beatty Hall 103
3:05 – 3:15	Welcome and Opening Remarks, Jody Gordon (Wentworth Institute of Technology) Beatty Multipurpose Room, Beatty Hall 119

- 3:15 – 5:15     **Session I: App/Database Development and Use for Mobile Computing in Archaeology**  
 Beatty Multipurpose Room, Beatty Hall 119  
 Moderator: Eric Poehler (University of Massachusetts-Amherst)
- Agenda:** The session highlights the mobile apps and databases currently being used by various projects for field recording and spatial visualization and how the development of new apps will improve the integration of data and workflow in the future.
- 3:15 – 3:40     “If I Knew Then What I Know Now: Reflections on Custom Mobile App Development,”  
 Sam Fee (Washington and Jefferson College)
- 3:40 – 4:05     “Beyond the Basemap: Site and Landscape through Low Altitude Aerial Photogrammetry and Mobile GIS in the Andes,” Steven A. Wernke (Vanderbilt University), Julie A. Adams (Vanderbilt University), Eli Hooten (Vanderbilt University), Gabriela Oré (Vanderbilt University), Carla Hernández (Vanderbilt University), and Aurelio Rodríguez (Independent Scholar), Giancarlo Marcone (Proyecto Qhapaq Ñan, Ministry of Culture of Peru)
- 4:05 – 4:30     “Digital Imaging and Spatial Analysis in Archaeology: Problems and Prospects,” Brandon Olson (Boston University) and Manny Moss (City University of New York)
- 4:30 – 4:55     “Mukurtu CMS: Differential Access for the Ethical Stewardship of Cultural and Digital Heritage,” Michael Ashley (Center for Digital Archaeology – UC Berkeley)
- 4:55 – 5:15     Moderated Discussion
- 5:15 – 5:30     BREAK
- 5:30 – 6:30     **Keynote Lecture: “Why Paperless?: Digital Technology and Archaeology”**  
 John Wallrodt (University of Cincinnati)  
 Beatty Hall Room 426

**DAY 2                   February 28**

- 7:30 – 8:30 am     **Registration and Continental Breakfast**, Casella Gallery, Annex Central
- 8:15 – 8:20       **Welcome**, Blount Auditorium, Annex Central Building 106  
 Russell Pinizzotto, Senior Vice President for Academic Affairs and Provost  
 (Wentworth Institute of Technology)
- 8:20 – 8:30       **Opening Remarks**, Blount Auditorium  
 Erin Walcek Averett (Creighton University), Derek B. Counts (University of Wisconsin-Milwaukee), Jody Gordon (Wentworth Institute of Technology)
- 8:30 – 10:45     **Session II: Mobile Computing in the Field**  
 Blount Auditorium, Annex Central Building 106  
 Moderator: Steven Ellis (University of Cincinnati)

**Agenda:** This session allows participants to present experiments (both successful and unsuccessful) and best practices currently being developed by various projects using mobile computing in the field. The goal is to highlight the diverse ways mobile devices are being used in the field and explore the range of factors that impact different types of projects utilizing these tools. After the presentations, the moderator will lead a short discussion aimed at elucidating key issues in mobile data collection and analysis so that these issues can be revisited during the later Round Table Session.

- 8:30 – 8:55 “Pompeii and the iPad: New Practices, New Philosophies,” Steven Ellis (University of Cincinnati)
- 8:55 – 9:20 “Digital Pompeii: Dissolving the Fieldwork-Library Research Divide,” Eric Poehler (University of Massachusetts-Amherst)
- 9:20 – 9:45 “Integrating Digital and Physical Workflows in Archaeological Fieldwork: Lessons from Three Paperless Projects,” Chris Motz (University of Cincinnati)
- 9:45 – 10:10 “Digital Archaeology in the Rural Andes: Problems and Prospects,” Matthew Sayre (University of South Dakota)
- 10:10 – 10:35 “Postcards from the Pladypos: Field-Testing the First Generation of Cognitive Robots for Underwater Archaeology,” Bridget Buxton (University of Rhode Island) and Nikola Miskovic (University of Zagreb)
- 10:35 – 10:45 Moderated Discussion
- 10:45 – 11:00 **Coffee Break**, Casella Gallery
- 11:00 – 1:00 **Session III: Systems for Archaeological Data Management**  
Blount Auditorium  
Moderator: TBD

**Agenda:** This session focuses on archaeological information systems and how these integrated digital workflows manipulate archaeological data from the field to the repository. The presentations provide an overview of existing systems and demonstrate their key features to provide insights into different approaches to system design, data collection, processing and analysis, as well as issues of systems' interoperability. The goal is to initiate a dialogue between systems developers and users to shed light on current problems and future prospects for systems' design.

- 11:00 – 11:25 “Cástulo: a Test Site for a New Digital Information System,” Marcelo Castro (Regional Government of Culture and Sport, Junta de Andalucía, Jaén, Spain), Francisco Arias (Archaeological Ensemble of Cástulo, Linares, Spain), María Libertad Serrano, Ana Martínez Carrillo, Manolo Serrano Araque (Forvm MMX Project, Linares, Spain)
- 11:25 – 11:50 “CSS for Success? Exploring Browser-Based Data Collection Using Tablets and the Archaeological Recording Kit (ARK),” Andrew Dufton (Brown University)

- 11:50 – 12:15 “Digital Archaeology in the Private Sector: Leveraging Technology in Cultural Resource Management,” Ted Roberts and Shawn Fehrenbach (PaleoWest Archaeology)
- 12:15 – 12:40 “Creating Interoperable Digital Datasets: the Federated Archaeological Information Management Systems (FAIMS) Project,” Shawn Ross (FAIMS Project, Macquarie University, Australia)
- 12:40 – 1:00 Moderated Discussion
- 1:00 – 2:00 **Break for Lunch**
- 2:15 – 3:45 **Session IV: Pedagogy, Data Curation, & Reflection**  
Blount Auditorium  
Moderator: Eric Kansa (University of California-Berkeley)
- Agenda:** Archaeology continues to be revolutionized through the integration of new digital technologies into its methods and processes. Historically, technology has greatly enhanced archaeologists' ability to understand the past, yet technology also alters the ways that archaeologists approach their data in relation to pedagogy, analysis, and long-term preservation. This session's goal is to reflect on the ways that mobile computing and open access data management are changing how archaeologists develop and teach field methods, as well as how they interact with objects and sites as new datasets are born and old ones are revisited in increasingly rapid and multifaceted ways.
- 2:15 – 2:40 "Teaching Archaeology with a Digital Data Collection Protocol," Rebecca Bria (Vanderbilt University)
- 2:40 – 3:05 “Technology and Teaching at the Athienou Archaeological Project, Cyprus,” Jody Gordon (Wentworth Institute of Technology), Kyo Koo (Davidson College), Michael K. Toumazou (Davidson College), Derek B. Counts (University of Wisconsin-Milwaukee), Erin Walcek Averett (Creighton University)
- 3:05 – 3:30 “Teaching Practice While Developing Practice: Mobile Computing at the Gabii Project Field School,” Rachel Opitz (University of Arkansas)
- 3:30 – 3:55 “From the Web to the Field: Using Online Data Collections in Field Research,” Eric Kansa (University of California-Berkeley)
- 3:55 – 4:20 “On Screen Triples: Linked Open Data and Born Digital Archaeological Data,” Sebastian Heath (Institute for the Study of the Ancient World, New York University)
- 4:20 – 4:45 “Toward a Slow Archaeology,” Bill Caraher (University of North Dakota)
- 3:45 – 4:00 **Coffee Break**, Casella Gallery
- 4:00 – 5:30 **Round Table Session: The Potential of Mobile Computing, the Future of Digital Archaeology, & Broader Implications**  
Blount Auditorium, Annex Central Building 106

Moderators: Derek B. Counts (University of Wisconsin-Milwaukee) and Sebastian Heath (Institute for the Study of the Ancient World, New York University)

**Topic 1:** Mobile computing in the field: past experiences and future directions.

**Topic 2:** Making digital archaeology the norm – how do we accomplish parity in the use of digital technologies among projects of different scope and funding? What online presence can be created to help start-up projects and projects lacking technical support achieve this?

**Topic 3:** App accessibility? Off-the-shelf or build your own? Should all projects have an integrated FAIMS-type system workflow?

**Topic 4:** What is the broader significance of digital archaeology and mobile computing for the humanities? How do these types of changes in the way we “do” humanities affect how we cognitively craft our research processes and how we interpret our evidence? How does this enhance dissemination of information and visitor experience and create a dynamic educational environment?

**Topic 5:** Brainstorming a ‘manifesto’ for mobile computing in archaeology. What would such a manifesto look like ideally? Should it be inclusive, reflexive?

6:00 – 7:00

**Plenary Lecture: “The Ara Pacis and Montecitorio Obelisk of Augustus: a Sempirical Investigation”**

Bernard Frischer (Indiana University)

Blount Auditorium, Annex Central Building 106

## **Appendix B: Mobilizing the Past Workshop Abstracts**

In alphabetical order by presenter:

### **“Mukurtu CMS: Differential Access for the Ethical Stewardship of Cultural and Digital Heritage”**

*Presenter:*

Michael Ashley (Center for Digital Archaeology – UC Berkeley)

Archaeological research projects rarely occur in vacuums, but are situated in often-complex circles of interested parties - the stewards and stakeholders who may have rightful claims to the archaeological places and to the archaeological knowledge being withdrawn from them. As archaeologists, we are afforded a powerful position of deciding what is knowledge, what is data, who gets access, under what circumstances, if at all.

In this discussion, we will look at where we're failing and succeeding to connect with stakeholder priorities for differential access to cultural content, and what this means for all of us in developing informed exchanges for digital archaeology. We'll explore Mukurtu CMS, a free and open source platform designed specifically to address some of these challenges and how community based agile software development can help to humanize our discipline.

Mukurtu CMS has been built in collaboration with indigenous communities worldwide, and addresses the need for differential access to knowledge based on cultural protocols that are in practice within and around communities, and that define interactions with the public, researchers, governmental organizations, and archaeologists. Mukurtu CMS is both an ethos and real software, designed to promote ethical exchange from planning to publishing. We will discuss the roadmap and demonstrate the applications, released and forecast, including Mukurtu CMS, Mobile, Exhibit, and Mukurtu.net, and how they can be weaved into any archaeological endeavor.

### **“Teaching Archaeology with a Digital Data Collection Protocol”**

*Presenter:*

Rebecca Bria (Vanderbilt University)

In 2011, the Proyecto de Investigación Arqueológico Regional Ancash (PIARA, Peru) inaugurated an archaeological field school that employed a comprehensive digital data collection protocol for field and laboratory archaeological research. We taught students how to record and organize archaeological data on computer tablets using our custom relational databases for excavation, human skeletal recovery and analysis, and artifact classification. The databases integrated digital media, such as vector drawings, annotated photos, and Harris matrices. We also instructed students to digitally map features and artifacts, lay out an excavation grid with a total station, and georectify then draw plan maps using GIS. The students used the computer tablets to visualize relationships between the data, analyze the excavation contexts, and make preliminary interpretations.

This paper reviews the benefits and challenges of using a 100% digital data collection protocol to teach archaeological methods to students. It discusses how digital data collection and analysis can enhance student understanding of archaeological field and laboratory analysis, especially when paired with training in traditional pencil and paper data collection techniques. Through an analysis of three years of our field school training, the paper argues that digital technology is not simply a means of more efficient data collection. Rather our digital database develops more perceptive archaeologists who can immediately recognize and interpret different possible relationships between archaeological materials, contexts, and features. The technology, then, not only aids in-field planning and interpretation, but also cultivates critical thinking skills.

### **“Postcards from the Pladypos: Field-testing the First Generation of Cognitive Robots for Underwater Archaeology”**

*Presenter:*

Bridget Buxton (University of Rhode Island) and Nikola Miskovic (University of Zagreb)

Since the early years of the modern discipline, nothing in underwater archaeology has evolved as dramatically as the technology for site and landscape recording. Photogrammetry, Photo-modeling, SLAM, and various acoustic imaging systems have all been touted as the 'next big thing' in digital mapping. Yet as much as archaeologists are eager to trade the laborious work of manual recording for the promises of the latest gadgets, we have yet to find a site-mapping technology with enough clear advantages for it to be widely adopted. Issues of cost, accuracy, and post-processing time are usually paramount. The capability to translate points and images into archaeologically useful data and diagrams is also a concern. In this paper I discuss the experience of using the Pladypos cognitive diving robot built by the University of Zagreb to map the ancient port of Caesarea, and offer some ideas about the future of robotics in underwater archaeology.

### **“Toward a Slow Archaeology”**

*Presenter:*

William Caraher (University of North Dakota)

Over the past century, technology has influenced archaeology in myriad ways. From photography, the introduction of personal computers, to the use of 3D scanners, tablet computers, and open access online datasets, archaeology has long embraced the latest technologies to document artifacts and contexts in increasingly detailed ways. Technology has had a particularly significant impact on field practices by shaping archaeological workflow and the social organization of archaeological projects. This has brought with it some obvious rewards in terms of efficiency, detail, and consistency of archaeological recording.

In recent decades these changes have accelerated with rapid changes in technology, and many archaeologists find themselves spending as much time looking at a computer screen as a trench or survey unit. The interplay of technology and archaeological methods have slowly changed how we work in the field. Complex tasks have increasingly been fragmented to produce data friendly bits of information that become the basis for archaeological analyses conducted in a computer lab or a faculty office. The archaeologist has increasingly seen the field as the place for efficient data collection and analysis as something that occurs later. This paper introduces the idea of "slow archaeology" as a way to prompt some critical reflection on this way that technology has impacted the production of archaeological knowledge, the structure of fieldwork, and, ultimately, the nature of the discipline.

### **“Cástulo: a Test Site for a New Digital Information System”**

*Presenters:*

Marcelo Castro (Regional Government of Culture and Sport, Junta de Andalucía, Jaén, Spain), Francisco Arias (Archaeological Ensemble of Cástulo, Linares, Spain), María Libertad Serrano (Forvm MMX Project, Linares, Spain), Manolo Serrano Araque (Forvm MMX Project), Ana Martínez Carrillo (Forvm MMX Project)

The site of Cástulo is located near Linares in the province of Jaén, Andalusia, Spain. The site was continuously occupied from prehistory to the sixteenth century CE. Following the short slumber of a few centuries, Cástulo has resurfaced as a new model of community work. Cástulo's Project Forvm MMX has developed a new system of archaeological documentation, provisionally called TooWaste. The system was created with several concepts in mind: the immediate transmission of archaeological data from the site to database and the creation (and optimization) of a standard work-method for both the site and the laboratory in the museum. The system was designed to allow the simultaneous work of several teams (excavators, supervisors, conservators, and researchers).

The tools used are simple: paper forms with a pattern of micro-dots; a microscanner in a digital pen that allows the device to recognize the field being completed in the database; a smartphone connected to the pen via

Bluetooth to receive data; and our server/database, connected via a data connection to the smartphone. There are five different forms for excavators to use depending on the type of information to be recorded: spatial data, drawings, descriptions of stratigraphy, and the inventory of materials found. We are also able to include three-dimensional models in TooWaste using a GIS. These models can be used by researchers to visualize the data collected during excavation. TooWaste also generates a unique QR code for every single artifact in the database, allowing for instant identification of any object and its relationship to the site.

### **“CSS for success? Exploring Browser-based Data Collection Using Tablets and the Archaeological Recording Kit (ARK)”**

*Presenter:*

Andrew Dufton (Brown University)

The Archaeological Recording Kit (ARK) is an Open Source system for flexible, web-based archaeological data management. Designed to facilitate simultaneous data creation and dissemination through a simple web interface, ARK faces new challenges with the growing use of tablets for on-site recording. How do mobile systems interact with ARK's single-server functionality? Should the ARK team develop a stand-alone tablet application?

This paper looks at a range of projects exploring mobile data collection using the ARK system. The scope of these projects ranges from a traditional research-driven excavation at Hadrian's Villa at Tivoli, to a crowd-funded community project in the British countryside, to commercially-driven rescue work in the heart of London, to a methods class taught on the Brown University campus. A discussion of the potentials and pitfalls of various integration techniques used in these case studies will provide insights on the most fruitful future directions for the ARK platform, and on the benefits of browser based data collection more generally for a paperless archaeological practice.

### **“Pompeii and the iPad: New Practices, New Philosophies”**

*Presenter:*

Steven Ellis (University of Cincinnati)

This paper reviews the *longue durée* (of some four years or so) of using the iPad to record the excavations of one of the Mediterranean's largest and most complex urban sites. In that time a striking number of developments - in software and hardware - have taken place. For a discipline that is so deeply rooted in the 'traditional' way of doing things, it is not just the new form of paperless recording that can register deep shockwaves to the archaeological recording system, but the very concept itself of rapid and ongoing changes in those paperless methodologies. So beyond tracking some of these developments and their proven and potential contributions, this paper is interested in the disciplinary-wide reception of paperless recording methods. This review thus turns its attention to the philosophies of digital recording methods and takes a critical approach to both traditional and paperless recording practices for (especially) large urban sites with very variable datasets.

### **“If I Knew Then What I Know Now: Reflections on Custom Mobile App Development”**

*Presenter:*

Sam Fee (Washington and Jefferson College)

With the widespread adoption of tablet computers in 2010, archaeologists quickly began to envision new ways of completing old tasks. The technology seemed particularly well suited for replacing our old paper-and-pencil approach to data collection. So, in 2011 we began writing a custom application - PKapp - for the 2012 field season of the Pyla-Koutsopetria Archaeological Project on Cyprus. That application taught us how to write software for mobile devices, while also illuminating numerous possibilities for digital workflow in archaeological field research.

In the subsequent years, mobile computing devices and software development tools have improved considerably, making them even more useful for custom application development and data collection in the field. Further, HTML5 open source standards can ensure the software runs on any device regardless of operating system platform. Even better, a robust selection of coding interfaces, libraries, and frameworks can speed up the development process and allow us to get away from hand-coding each line of our applications (as might have been the case just a few short years ago). Thus in many ways, it is easier and faster to write your own custom data collection mobile app today than it was in 2011. This paper reflects upon our earlier work with PKapp, reflects upon the lessons learned, and describes how custom app development with open source standards might be undertaken today.

### **Plenary Lecture: “The Ara Pacis and Montecitorio Obelisk of Augustus: A Sempirical Investigation”**

*Presenter:*

Bernard Frischer (School of Informatics, Indiana University)

#### **Abstract**

This talk first reports on research undertaken to determine the validity of Edmund Buchner’s theory that the Montecitorio obelisk was aligned to the Ara Pacis such that during the day of Augustus’ birthday (September 23, according to Buchner) the shadow of the obelisk proceeded down the equinoctial line of a hypothesized horizontal sundial inscribed on a monumental pavement to or toward the center of the Ara Pacis. The research project developed and utilized: two new, independent surveys of the meridian fragment discovered by Buchner under the building at Via di Campo Marzio 48; the newly-available Edmund Buchner Archive housed at the AEK, Munich; and an interactive computer simulation of this area of the ancient city as well as the apparent path of the sun in the sky during the period 9 BC to 40 AD. The major conclusions reached by the research project are that: (1) Buchner was correct to postulate a solar alignment between the Ara Pacis and the obelisk; (2) Buchner’s positioning of the meridian and obelisk should be corrected; and (3) once these corrections are made, Buchner’s theory is not confirmed. Finally, (4) the computer simulation suggests that an alternative theory may better account for the alignment, viz., that the point was to stand on axis with the east entrance of the Ara Pacis on the Via Flaminia and see the sun’s disk seemingly centered on the top of the pyramidion of the obelisk during the afternoon of October 9. That date is significant: it is the festival day of Apollo Palatinus, a god with whom Augustus had a particularly close relationship. I conclude with some general remarks about sempiricism: a new methodology made possible by interactive simulations of historical monuments and sites. Sempiricism holds great promise for the disciplines of archaeology as well as architectural, art, and cultural history.

### **“Technology and Teaching at the Athienou Archaeological Project, Cyprus”**

*Presenters:*

Jody Gordon (Wentworth Institute of Technology), Kyo Koo (Davidson College), Derek Counts (University of Wisconsin-Milwaukee), Erin Walcek Averett (Creighton University), Michael Toumazou (Davidson College)

For the last 25 years, the Athienou Archaeological Project (AAP) has conducted pedestrian survey and excavations of domestic, religion, and funerary sites in the Malloura Valley on the island of Cyprus. From its inception, the project has made the training of undergraduate students a key element of its archaeological process and method. AAP thus enhances our understanding of inland Cyprus, while at the same time training a new generation of archaeologists. To enhance excavation, interpretation, and the field school, the project has recognized the utility of integrating emergent technologies into the excavation process and has acknowledged the importance of acquainting students with such technologies. Indeed, since 1990, AAP has participated in the transition from handwritten notebooks to born-digital, tablet-based recording. Therefore, AAP offers a unique perspective from which to observe the digital age’s influence on archaeology. Drawing on this experience, in 2011 AAP proved to be one of the first projects to embrace the “paperless” archaeology revolution that is quickly becoming standard in field archaeology.

This paper describes AAP's transition to a born-digital, tablet-based, archaeological recording system and web-based, PHP-coded database, and how this experiment has influenced its data recording, site interpretation, and pedagogical methods. We discuss the benefits and drawbacks of system implementation, and demonstrate how born-digital data recording has provided immediate logistical and academic benefits that have positively influenced both research and teaching. Overall, by sharing our experience, we hope to engender comparisons with other projects implementing born-digital recording protocols and to contribute to best practices within the discourse of digital archaeology.

### **“On Screen Triples: Linked Open Data and Born Digital Archaeological Data”**

*Presenter:*

Sebastian Heath (Institute for the Study of the Ancient World, New York University)

This paper explores the utility of Linked Open Data (LOD) as framing metaphor when considering the role of tablet computing in archaeological workflows. In doing so it will particularly look for overlap between the rhetoric of materiality that exists both within the interfaces of touch-screen devices and within the terminology of LOD. For its part, LOD encourages the use of “things, not strings.” For example, the physical place identified by the English string of characters “Rome” as meaning the capital of the ancient empire becomes a more flexible and reusable entity within a dataset when its Pleiades identifier “<http://pleiades.stoa.org/places/423025>” is used instead. Tablets are a natural environment for moving the metaphor of web address as “thing” into the realm of actual user experience (UX). Tablets already allow direct manipulation of on-screen controls to support such actions as scrolling through lists of information. This paper asks if that idea can be pushed forward to manipulation of flexible data types and the links between them.

### **“From the Web to the Field: Using Online Data Collections in Field Research”**

*Presenter:*

Eric C. Kansa (University of California-Berkeley)

Digital data, if considered at all, hovers at the margins of intellectual interest in archaeology. Data carry mainly operational and bureaucratic concerns, to be “managed” (in the parlance of the NSF) and maybe archived. In this light, NSF data management plan requirements, which hardly ever see meaningful peer-review, reinforce the notion that data have more to do with administrative compliance and little to do with the intellectual core of research. Thus, discussions about data heavily focus issues of standards, metrics, interoperability, “best practices,” and required investments in cyberinfrastructure.

As the adage goes: “Garbage in, Garbage out.” Bureaucratically mandated data archiving may fill our repositories, but is our discipline filling our repositories with anything useful? Recent studies of data curation practices highlight the challenges of data reuse. To better realize the full potential of using data, archaeology needs to see fundamental changes in research practices and professional roles, expectations, and inclinations. Open Context's experiments with data sharing as a form of publishing help highlight needs for a host of new skills and professional roles. Moreover, these experiments show how access to data created by our peers, together with open communication and collaboration at each stage of the research processes, can enhance the quality and research value of data. Without more experimentation and thought in how we situate archaeological data in the creation and transmission of archaeological knowledge, we will merely optimize the status quo, and do little to open new horizons for understanding the past.

### **“Integrating Digital and Physical Workflows in Archaeological Fieldwork: Lessons from Three Paperless Projects”**

*Presenter:*

Chris Motz (University of Cincinnati)

This paper draws on the author's four years of experience developing and/or managing paperless recording systems for three archaeological projects: the Sangro Valley Project (Abruzzo, Italy), the Pompeii Archaeological Research Project: Porta Stabia (Pompeii, Italy), and the Say Kah Archaeological Project (Say Kah, Belize).

Since 2011 the Sangro Valley Project (SVP) has employed a custom-built paperless recording system with iPads and FileMaker at its core. This paper summarizes the evolution of the SVP's paperless system and will present some lessons learned during the SVP's four seasons of paperless recording as well as the author's work with other projects. It identifies some of the most common problems that are encountered during the implementation of paperless recording systems and finally offers recommendations for avoiding or fixing them. Many of these problems are not unique to projects with digital recording systems, and most of the difficulties were not technical in nature. Rather, many of the most significant problems arose from integrating workflows. This includes not only digital and physical workflows, but also the workflows of different actors in the project. Digital recording systems can streamline fieldwork, improve the quality of data collected in the field, and significantly reduce errors and misunderstandings, but they require careful and thoughtful preparation and implementation.

### **“Digital Imaging and Spatial Analysis in Archaeology: Problems and Prospects”**

*Presenters:*

Brandon R. Olson (Boston University) and Manny Moss (City University of New York)

Archaeology is an inherently destructive discipline whose practitioners are obliged to document their effects upon the material record in a meaningful way. While documentation methods have taken many forms, most are two-dimensional representations of a three-dimensional (3D) phenomenon. Advances in 3D technology, however, now make it possible to quickly generate accurate, photorealistic 3D models of any object of interest using a series of digital still photographs. Using various algorithms, a handful of commercially available software packages offer solutions for high quality 3D documentation applicable to archaeology. This technology, referred to here as image-based modeling, has rapidly proliferated within the discipline, as several projects have implemented 3D documentation techniques for a variety of purposes. With the rapid adoption of a new technology, the early stage of implementation presents certain pitfalls that must be addressed before image-based modeling can become a viable component of an ever-expanding digital archaeological toolkit. Though there are certainly other solutions beyond the scope of our discussion, we seek to present possible solutions to three pitfalls that image-based modeling practitioners will (or are) currently facing: curation (how does one responsibly organize and store 3D models and their associated files?), dissemination (how can these data be made useful to other team members during a field season?), and interpretation (how can these data be maximally utilized to address both real-world and theoretical/conceptual archaeological problems?).

### **“Teaching Practice while Developing Practice: Mobile Computing at the Gabii Project Field School”**

*Presenter:*

Rachel Opitz (University of Arkansas)

Mobile tablets are increasingly commonplace on excavations, and (optimistically) rapidly on pace to be pervasive. They open a world of possibilities for collecting and sharing better information in better ways. Taking advantage of the possibilities afforded by the new tools that continue to appear on the market (3D on mobile! Real time sync! IR photography!) is what gets many of us excited and we want to make the most of what mobile tablets have to offer. Trying out new recording strategies and techniques and continually improving our digital field practice are essential to bringing mobile digital technologies onto excavations. For projects run as field schools, where students are actively engaged in the recording process, this poses certain challenges. We're trying to teach students what to do in the field, and how the documentation system works, and why we record what we record, often while learning ourselves or changing our strategies. For someone trying to take on the deluge of practical information

(e.g. how to trowel, the difference between ceramic and tufa, what “compactness” and “sorting” mean) the deluge of excavation minutiae (something as small as re-ordering the boxes on the digital context sheet) can introduce significant confusion. Add to this a variety of different learning styles, levels of experience, and inherent levels of comfort with technology that are inevitable within a large group and a real challenge emerges. How can we best push forward, implementing new technologies and methods, and continually challenging ourselves while providing a valuable learning experience for students?

### **“Digital Pompeii: Dissolving the Fieldwork-Library Research Divide”**

*Presenter:*

Eric Poehler (University of Massachusetts-Amherst)

Critical reading of stratigraphy and bibliography are, though obviously different skills, equally critical to archaeological inquiry. These intellectual acts are separated not only by the different cognitive functions they engage (spatial vs. narrative) but also by the time and distance between the trench and the library. In the 21<sup>st</sup> century, the advent of new and diverse forms of digital archaeological practice is revolutionizing the ways in which archaeologists work in the field. We have already witnessed the first part of the revolution: the transformation of archaeological methods of data collection and, to a lesser extent, how such data are accessed and deployed in the field. A second facet of the digital revolution is just beginning: the growing availability of published scholarship in digital form, downloaded to the trench edge. It seems inevitable that secondary sources soon will be as easy to implement in the field as the trowel, effectively (if theoretically) dissolving the spatio-temporal division between fieldwork and library work. In this paper, I wish to describe two examples of this dissolution of the fieldwork-library divide: one archival in nature (the online platform, *DM*, used by the Pompeii Quadriporticus Project), the other bibliographic (the Pompeii Bibliography and Mapping Project). The brief discussion of each platform’s operation is intended to set the stage for a more speculative foray into how such digital practices will transform archaeological practice in the coming decade, its advantages and pitfalls. What will it mean to choose from among so many possible aspects of research: digging (data collection), primary (stratigraphic) and secondary (bibliographic) analysis, interpretation (phasing and contextualization) and narrative synthesis (writing)?

### **“Digital Archaeology in the Private Sector: Leveraging Technology in Cultural Resource Management”**

Ted Roberts and Shawn Fehrenbach (PaleoWest Archaeology)

PaleoWest Archaeology has developed an innovative approach to archaeological projects, employing a fully digital workflow for data collection and management. Our purpose is to improve the quality of data collected in the field while simultaneously making the process more efficient, allowing us to deliver a higher quality product to our clients at a better value. Our approach employs a customized database system and carefully selected suite of applications that are leveraged from smartphones and tablets, as well as traditional computers. Field tasks that once required point-and-shoot cameras, graph paper and rulers, stand-alone handheld GPS units, and a litany of paper forms are accomplished by PaleoWest teams armed with fully customized iPads and iPhones. Data from photos to forms to locations are managed in a central database, where PaleoWest staff in the field and office can work together on the data using applications with simple and intuitive user interfaces. Data are easily exported into reporting documents for final delivery to our clients. The system thus eliminates digitization after fieldwork, eliminates redundancies in data entry, reduces error in data entry, improves data security via networking, and allows concurrent reporting as office staff work with data in real time from the field. The research and development began in 2009 and was completed in early 2013, though emerging technologies and new ideas and problems continue to shape and inform this system.

### **“Creating Interoperable Digital Datasets: the Federated Archaeological Information Management Systems (FAIMS) Project”**

*Presenter:*

Shawn Ross (FAIMS Project, Macquarie University, Sydney, Australia)

The Federated Archaeological Information Management Systems (FAIMS) project has developed a community-driven, open-source platform for mobile recording of field and laboratory data. Responding to the initial requirements voiced by archaeologists, the FAIMS mobile platform (an Android application supported by an Ubuntu server) integrates the capture of structured, narrative, geospatial, and multimedia data, while automating processes such as data synchronization, backup, and version control across multiple devices. The entire system also works offline. Recognizing the diversity of archaeological practice, FAIMS incorporates customizable data structures, interface behavior, and export formats. At the same time, archaeological research benefits from the production and dissemination of reusable and re-purposable datasets. To accommodate both flexibility and interoperability, FAIMS software provides tools to map data to shared vocabularies as it is created. Using an approach borrowed from IT localization, interface text, including the names of entities (e.g., 'stratigraphic unit'), attributes (e.g., 'soil color'), and controlled-vocabulary values ('Munsell 5YR'), can be saved and exported using widely-shared terminology (including uniquely identified terms in an ontology) but displayed using the preferred language of an individual project (e.g., 'stratigraphic unit' can display as 'context'). Second, open-linked data URIs can be embedded in all entities, attributes, and controlled-vocabulary values (linking, e.g., species to the Encyclopedia of Life, or places to Pleiades). Finally, data can be systematically transformed or amplified during export, a final opportunity for mapping to shared ontologies or linking to URIs. These approaches balance the flexibility required by archaeologists with the ability to produce interoperable data.

### **"Digital Archaeology in the Rural Andes: Problems and Prospects"**

*Presenter:*

Matthew Sayre (University of South Dakota)

The Stanford Archaeological Project at the UNESCO World Heritage site of Chavin de Huantar, Peru, has had a long and fruitful engagement with mobile technologies. We were early adopters in the use of photogrammetry, standardized use of theodolites, laser scanner mapping, and the use of aerial photography in site mapping. Here I consider the use and role of the Reveal Program in digital archaeology. Much of the program seems to have been designed with Mediterranean Archaeology in mind and our project encountered certain limitations with the program while attempting to employ it in a rural Andean setting. The lack of access to reliable internet and the limited ability to repair damaged goods negatively impacted our experience with this technology. Additionally, issues arose in using digital mobile technologies at a temple site with great time depth and incredible stratigraphic variation partially derived from ancient large-scale movement of earth. Our project is moving ahead with mobile computing and is interested in benefiting from the best practices shared at this conference as well enhancing future collaborations with similarly engaged researchers.

### **Keynote Lecture: "Why Paperless?: Digital Technology and Archaeology"**

*Presenter:*

John Wallrodt (University of Cincinnati)

This presentation explores the impact of digital recording technologies in archaeology, both in excavation and survey. Although archaeologists have embraced the latest technologies in photography, geophysics, material sciences, and environmental studies, we have been slow to adopt new recording devices and methods for primary field data collection. Despite the huge cultural shift to paperless technologies and its incorporation into many disciplines, most archaeological projects continue to rely on paper forms and hand written notebooks.

Using the examples of PARPS (Pompeii Archeological Research Project: Porta Stabia), a three-year excavation, and KARS (Kea Regional Archaeological Project), a three-year regional survey, I highlight the benefits of paperless projects and discuss some of the pitfalls. The obvious shortcomings are the initial cost of the equipment and

training. In both projects, however, the benefits far outweigh the shortcomings. Digital recording allows us to increase the accuracy of the data, enabling immediate cross-referencing, and to circulate the data promptly, which improves the information flow for the project. These developments limit errors and provide the opportunity to repair any extant errors directly.

Digital recording on these projects have also exposed weakness in the management structure of archaeological projects, especially in excavation, and afford us the opportunity to develop new approaches. In excavation, for example, most of the recording in the trench is still directed by a single trench supervisor. This management model dates to the origins of stratigraphic excavations and does not leverage the potential strengths of the other excavators in the trench. The shift from paper to paperless recording on tablets easily facilitates multivocality in the recording, which can greatly increase the quantity and quality of trench level observations. The continued adherence to the top-down management culture of excavation leads to observer bias and data gaps and thereby ignores the full potential of this new technology.

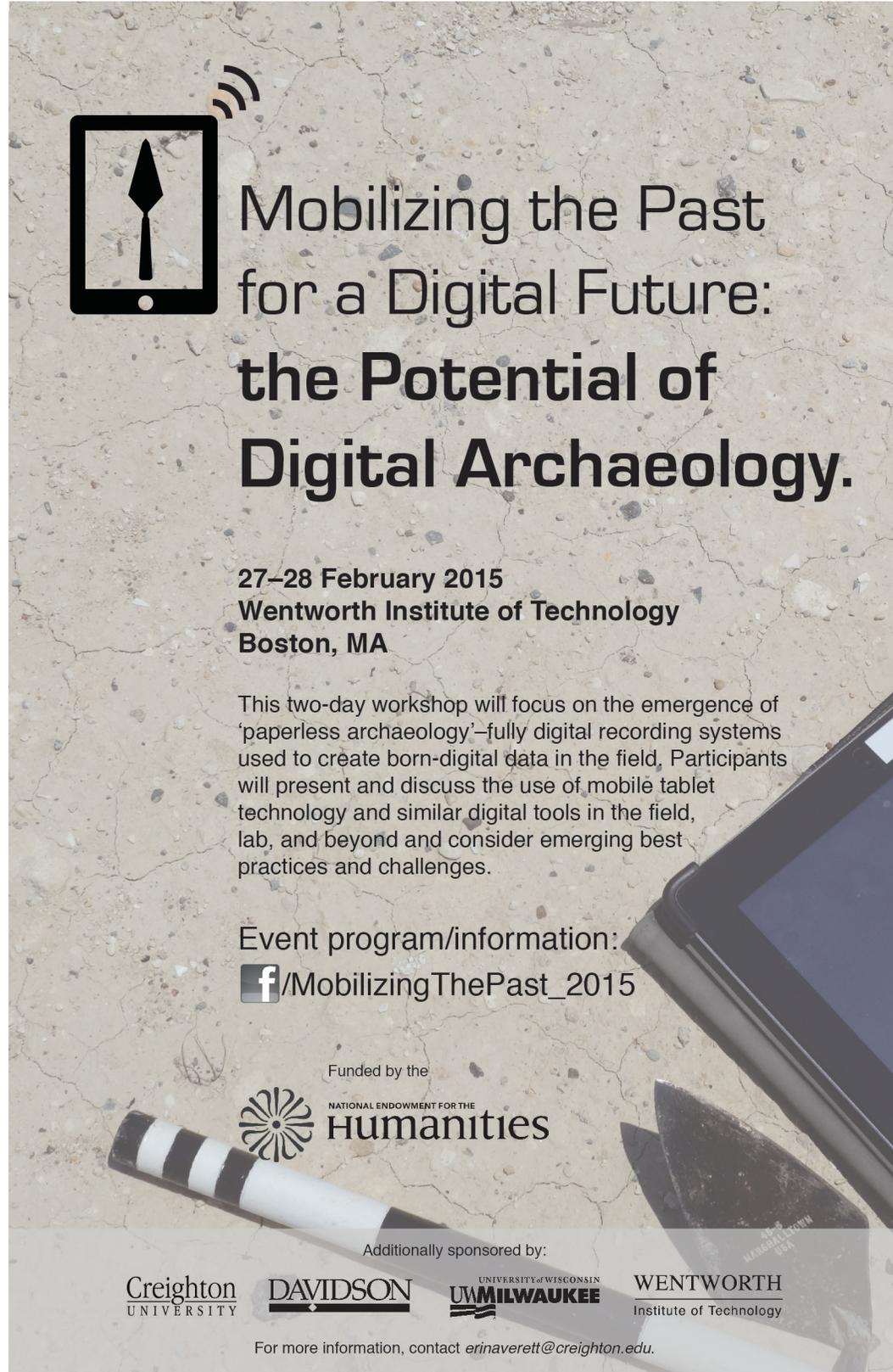
### **“Beyond the Basemap: Site and Landscape Survey through Low Altitude Aerial Photogrammetry and Mobile GIS in the Andes”**

*Presenters:*

Steven A. Wernke (Vanderbilt University), Julie A. Adams (Vanderbilt University), Eli Hooten (Vanderbilt University), Gabriela Oré (Vanderbilt University), Carla Hernández (Vanderbilt University), Aurelio Rodríguez (Independent Scholar), and Giancarlo Marcone (Proyecto Qhapaq Ñan, Ministry of Culture of Peru)

With the rapid development of UAVs (“drones”), photogrammetry, and mobile GIS, archaeology is at the cusp of major transformations in the basic methodologies for recording spatial and observational data at virtually all scales of analysis. We present a system for rapid low-altitude aerial survey and feature documentation using UAVs and lighter than air platforms, coupled with mobile GIS for intensive site survey. Starting at sea level and stepping up the vertical landscape of the Andes, we document sections of a major transverse Inka highway between the coast and highlands, documenting the road, its surrounding cultural landscape, and imperial logistical nodes. The data collection and processing production chain used to produce raster- and vector-based representations of archaeological settlements, features, and landscapes is presented. We document features made of wattle and daub (coast), adobe (coast and mid-elevation), and stone (highlands) in distinct terrain and ecological contexts. Subjects of analysis include imperial installations, settlements, and sections of the royal Inka highway and its environs. We discuss appropriate UAV designs and specifications for different environmental contexts and archaeological subjects. Secondly, we present a paperless, mobile GIS system for attribute registry, including architectural survey, intensive surface collections, and lichenometric dating. Together, high-resolution photogrammetry and mobile GIS provide richer, faster, and more cost effective data registry than traditional methods. We envision a near future in which UAVs and other low altitude platforms will become a commonplace means of extending the observational capabilities of research archaeologists and caretakers of archaeological patrimony.

## Appendix C: Workshop Poster



The poster features a background of cracked, light-colored earth. In the upper left, there is a black icon of a tablet with a white arrow pointing up and three curved lines above it representing a signal. The title is in large, bold, black font. Below the title, the dates and location are listed. A paragraph of text describes the workshop's focus. Below that, the event program information is provided with a Facebook icon. The funding source is the National Endowment for the Humanities. At the bottom, additional sponsors are listed with their logos. A black and white striped marker and a metal trowel are visible in the lower right corner of the poster.

 Mobilizing the Past  
for a Digital Future:  
**the Potential of  
Digital Archaeology.**

**27–28 February 2015**  
**Wentworth Institute of Technology**  
**Boston, MA**

This two-day workshop will focus on the emergence of ‘paperless archaeology’—fully digital recording systems used to create born-digital data in the field. Participants will present and discuss the use of mobile tablet technology and similar digital tools in the field, lab, and beyond and consider emerging best practices and challenges.

Event program/information:  
 /MobilizingThePast\_2015

Funded by the  
 NATIONAL ENDOWMENT FOR THE  
**Humanities**

Additionally sponsored by:

For more information, contact [erinaverett@creighton.edu](mailto:erinaverett@creighton.edu).

## Appendix D: Social Media Statistics

### Facebook Stats

#### 1. The people who like the Mobilizing the Past Page

Women 45%

Men 54%

Age Breakdown of above percentages:

Age	13-17	18-24	25-34	35-44	45-54	55-64	65+
Women	0%	13%	15%	8%	4%	3%	3%
Men	0%	4%	15%	11%	11%	4%	3%

#### 2. Country - Mobilizing Fans

United States of America - 93

Cyprus - 10

Spain - 7

United Kingdom - 6

Portugal - 4

Italy - 3

Greece - 3

Sweden - 2

Israel - 2

Canada - 2

#### 3. City - Mobilizing Fans

Omaha, NE - 13

Nicosia, Lefkoşa District, Cyprus - 6

Boston, MA - 5

Cincinnati, OH - 5

Chicago, IL - 5

Philadelphia, PA - 3

Columbia, MO - 3

Providence, RI - 3

Nashville, TN - 3

Jaén, Andalucía, Spain - 3

#### 4. Language - Mobilizing Fans

English (US) - 104

English (UK) - 14

Greek - 4

Spanish (Spain) - 4

Italian - 3

Catalan - 2

French (France) - 2

Portuguese (Portugal) - 2

Swedish - 2

Romanian - 1

## **Twitter Stats**

### **1. Tweets using the hashtag #MobileArc (2/25/15 to 3/2/15)**

Original Tweets – 711 (47.4%)  
@Message Tweets – 349 (23.27%)  
Retweets – 440 (29.33%)  
Total Tweets – 1,512

Reach - 143155  
Timeline Deliveries – 943923

### **2. MobileArc15 Twitter Account**

99 Current Followers

Month	Tweets	Tweet Impressions	Profile Visits	Mentions	New Followers
1/15	1	68	95	5	9
2/15	167	6,819	926	170	81
3/15	3	6,158	186	28	2
4/15	0	659	6	0	5
5/15	0	1,066	6	0	5

### **3. WordClouds**

#### **a. Shawn Graham**

User Bios - <https://twitter.com/electricarchaeo/status/571866193667047424>

Wordcloud from Day 1 - <http://shawngraham.github.io/exercise/mobilearcday1wordcloud.html>

Through Voyant - <https://twitter.com/electricarchaeo/status/571867092091338752>

#### **b. Russell Alleen-Willems**

<http://www.diachronicdesign.com/blog/2015/02/28/15-mobilizing-the-past-for-the-digital-future-conference-day-1-roundup/>

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## **Appendix F: Mobilizing the Past Chapter Abstracts & Author Bios**

In order of book chapters:

### **Introduction**

#### **Mobile Computing in Archaeology: Exploring and Interpreting Current Practices**

### **Authors**

Jody Michael Gordon, Erin Walcek Averett, Derek B. Counts

### **Abstract**

Since 2010, a range of mobile and internet-connected tablet computing devices (e.g., iPads) have been integrated into archaeological practice, with projects experimenting with new approaches to documenting, interpreting, and publishing material culture. The rapid pace of this change has led to a tension in the discipline as archaeologists have begun to realize how creating and manipulating born-digital data could fundamentally alter archaeological knowledge production. We are thus at a critical time for archaeology as it moves from a paper-based discipline to an increasingly digital one. There is a growing sense that the change is good, but that it must be critically and reflexively embraced to prevent the discipline from losing what has made it so vital to social discourse: its ability to shed light on the human past. This contribution outlines the debates surrounding digital archaeologies while laying the groundwork for their reflexive and ethical application. As the introductory chapter to *Mobilizing the Past for a Digital Future*, it draws on over twenty studies of contemporary digital archaeological practices to suggest that the transition to paperless workflows is an ongoing process that has the potential to improve archaeological interpretations. This review of current practices engages with the collection, manipulation, interpretation, and dissemination of archaeological data as it passes through the digital filter from trench side to the digital repository and examines what is being gained, lost, or changed through such processes. This overview not only presents a concise and informative introduction to the timely themes explored in the volume, but also offers a cumulative, informed, and critical perspective on how digital technologies are transforming archaeology and what it can tell us about the past.

### **Author Biographies**

Jody Michael Gordon is an Assistant Professor of Humanities and Social Sciences at Wentworth Institute of Technology in Boston and an Assistant Director of the Athienou Archaeological Project. He received his Ph.D. in classical archaeology from the Department of Classics at the University of Cincinnati, where his dissertation involved an archaeological study of the effects of imperialism on local identities in Cyprus during the Hellenistic and Roman periods. In addition to working in Cyprus, Jody has excavated in Tunisia, Italy, and Greece, and his research interests include Roman archaeology, cultural identity, ancient imperialism, and computer applications in archaeology.

Erin Walcek Averett is an Associate Professor of Archaeology in the Department of Fine and Performing Arts and Classical and Near Eastern Studies at Creighton University. She specializes in the art and archaeology of Greece and Cyprus, with special focus on terracotta figurines and Iron Age religion in the Eastern Mediterranean and an interest in 3D imaging in archaeology. She serves as the Assistant Director of the Athienou Archaeological Project on Cyprus.

Derek B. Counts is Professor and Chair of Art History at the University of Wisconsin-Milwaukee. He has published extensively on the archaeology of Iron Age Cyprus, with a particular emphasis on Cypriote religion, as well as limestone votive sculpture and its associated iconography. He is Associate

Director of the Athienou Archaeological Project, where he has been excavating for more than two decades.

### **1.1. Why Paperless: Technology and Changes in Archaeological Practice, 1996-2016**

#### **Author**

John Wallrodt

#### **Abstract**

The past 20 years have witnessed a slow march toward complete digitization of archaeological field data. In this paper, I assess the last two decades of academic archaeological fieldwork based on my experience with field projects in the Mediterranean, and propose a historical context for the adoption of paperless recording in the field. Drawing on the examples of the Troy excavations, the Pompeii Archeological Research Project: Porta Stabia, and the Kea Regional Archaeological Project, I review trends that include the commoditization of hardware, the early adoption of new hardware by specialists, the incorporation of specialist data into site-wide datasets, and the ways that this knowledge can be applied to direct digital entry of field observations via mobile devices.

#### **Author Bio**

John Wallrodt is a Senior Research Associate in the Department of Classics at the University of Cincinnati. He is a data architect for archaeological field projects in Turkey, Israel, Greece, and Italy sponsored by the department, and he has consulted on many archaeological projects in the Mediterranean. His research focuses on the interactive nature of disparate data sets created by divergent voices in large, multi-year, collaborative field projects. To this end, he is concerned with making archaeological data digital as soon as possible, a push that has led him to remove paper entirely from the field. He publishes semi-regularly on this topic in his blog Paperless Archaeology at <http://paperlessarchaeology.com>.

### **1.2. Are We Ready for New (Digital) Ways to Record Archaeological Fieldwork? A Case Study from Pompeii**

#### **Author**

Steven J. R. Ellis

#### **Abstract**

Beyond outlining some of the experiences and outcomes of the conversion of the University of Cincinnati's excavations at Pompeii to a "paperless" project, particularly through the highly publicized adoption of iPads to record our archaeological fieldwork, this paper is about our discipline's polarized response to such developments. In particular, it aims to set the pessimism about paperless methods, held by a sizable demographic, within a wider socio-academic context. Much of it is about admitting we have a problem: that is, a disciplinary consternation for changes to the ways we record data and produce knowledge in the field. More than a defense of the use of tablet computers over pieces of paper to record archaeological fieldwork, what follows is ultimately a call to balance our commonly romanticized views of *experience* and *tradition* in the ways we do things with the intellectual value in exploring new ideas and developments in core methodology.

#### **Author Bio**

Steven J. R. Ellis is a Roman archaeologist whose research interests cover the social and structural formation of ancient cities. His publications have explored Roman retail spaces; urban waste management; superstition; Roman coins; site formation processes; urban and sacred infrastructure; movement; social structures and their hierarchies, especially of the urban sub-elites; archaeological fieldwork methodologies; and the Roman fish-salting industry. Steven has directed and published archaeological projects in Italy and Greece, including the Pompeii Archaeological Research Project: Porta Stabia (PARP:PS), a project of the University of Cincinnati, where he is Associate Professor of Classics, and the American Academy in Rome.

### **I.3. Sangro Valley and the Five (Paperless) Seasons: Lessons on Building Effective Digital Recording Workflows for Archaeological Fieldwork**

#### **Author**

Christopher F. Motz

#### **Abstract**

Since 2011 the Sangro Valley Project (Italy) has employed a custom-built paperless recording system with iPads and FileMaker at its core. This paper summarizes the evolution of the project's paperless system and presents lessons learned during five seasons of use (2011–2015) and during the author's work with two other projects: the Pompeii Archaeological Research Project: Porta Stabia (Italy), and the Say Kah Archaeological Project (Belize). It identifies problems commonly encountered during the implementation of paperless systems and offers recommendations for avoiding or fixing them. Many of these problems are not unique to projects with digital recording systems, and most difficulties were not technical in nature. Rather, many of the most significant problems arose from integrating workflows. Digital recording systems can streamline fieldwork, improve the quality of data collected in the field, significantly reduce errors and misunderstandings, and facilitate new interpretive approaches, but they require thoughtful preparation and implementation.

#### **Author Bio**

Christopher F. Motz is a Ph.D. candidate specializing in Roman Archaeology at the University of Cincinnati. He received a M.A. in Classical Archaeology from Tufts University and a M.A. in Classics from the University of Cincinnati. His research interests include sub-elite material culture and spaces, the ancient economy, provinces and frontiers, material culture theory, archaeological methodology, and the application of technology in data acquisition, recording, and analysis. He has developed digital field recording systems for archaeological projects in Italy, Libya, and Belize, and he has consulted on systems for projects in Italy, Greece, Egypt, Ireland, and Jordan.

### **I.4. DIY Digital Workflows on the Athienou Archaeological Project, Cyprus**

#### **Authors**

Jody Michael Gordon, Erin Walcek Averett, Derek B. Counts, Kyosung Koo, and Michael K. Toumazou

#### **Abstract**

For the last 25 years, the Athienou Archaeological Project (AAP) has conducted pedestrian survey and excavations of domestic, religious, and funerary sites in the Malloura Valley on Cyprus. To enhance the project's research goals, excavation methods, and pedagogical mission, AAP has recognized the utility of

thoughtfully integrating emergent technologies into the excavation process and has acknowledged the importance of acquainting students with such technologies. Indeed, AAP has participated in the transition from handwritten notebooks to born-digital, tablet-based recording. In 2011 AAP was among the earliest projects to embrace the “paperless” archaeology revolution that is quickly becoming standard in field archaeology. This chapter describes AAP’s transition to a do-it-yourself (DIY) hybrid archaeological recording system that integrates both born-digital and tablet-based on-site methods with existing paper-based modes of field recording. We discuss the benefits and drawbacks of system implementation and consider the impact of born-digital data recording on project workflows, research, and teaching.

### **Author Bios**

Jody Michael Gordon is an Assistant Professor of Humanities and Social Sciences at Wentworth Institute of Technology in Boston and an Assistant Director of the Athienou Archaeological Project (AAP). He received his Ph.D. in Classical Archaeology from the Department of Classics at the University of Cincinnati, where his dissertation involved an archaeological study of the effects of imperialism on local identities in Cyprus during the Hellenistic and Roman periods. In addition to working in Cyprus, Jody has excavated in Tunisia, Italy, and Greece, and his research interests include Roman archaeology, cultural identity, ancient imperialism, and computer applications in archaeology.

Erin Walcek Averett is Associate Professor of Archaeology in the Department of Fine and Performing Arts and Classical and Near Eastern Studies at Creighton University. She serves as the Assistant Director of the Athienou Archaeological Project (AAP) on Cyprus, where she has been excavating since 1997. She specializes in the art and archaeology of Greece and Cyprus, with special focus on terracotta figurines and Iron Age religion in the eastern Mediterranean. Her research area additionally includes 3D imaging and digital tools in archaeology, with a special interest in 3D artifact models for research and publication. She has recently published articles on Cypriot masks and the AAP 3D imaging project in the *American Journal of Archaeology and Antiquity*.

Derek B. Counts is Professor and Chair in the Department of Art History at the University of Wisconsin-Milwaukee. He has published extensively on the archaeology of Iron Age Cyprus, with a particular emphasis on Cypriot religion, as well as limestone votive sculpture and its associated iconography. His research interests also include 3D visualization in archaeology and its impact on interpretation and publication. He is Associate Director of the Athienou Archaeological Project (AAP), where he has been excavating for more than two decades. Recent books include *The Master of Animals in Old World Iconography* (2010, co-edited with Bettina Arnold) and *Crossroads and Boundaries: The Archaeology of Past and Present in the Malloura Valley* (2011, co-edited with AAP colleagues).

Kyosung Koo (Ph.D., University of Iowa) has served as an ITS specialist for the Athienou Archaeological Project (AAP) since 2011. In addition to providing advice on effective use of technology for digital data recording, he developed AAP’s database and its web application. He is an academic technologist at Davidson College, where he promotes and supports best practices in the pedagogical uses of technology.

Michael K. Toumazou is Professor of Classics at Davidson College, where he has taught since 1987. As a field archaeologist with extensive experience in both Greece and Cyprus, he has directed the Athienou Archaeological Project (AAP) on his native island of Cyprus since 1990. His publications include articles in *Old World Archaeology Newsletter*; *Journal of Field Archaeology*; *Annual Report to the Department of*

Antiquities, Cyprus; *Cahier du Centre d'Études Chypriotes*; and translations of several works from Greek to English. Michael's research, which has been funded by grants from Dumbarton Oaks, the National Endowment for the Humanities, and the National Science Foundation, centers on the history and prehistory of Cyprus, Greece, and the Levant, as well as on mortuary practices and ancient Greek art.

### **1.5. Enhancing Archaeological Data Collection and Student Learning with a Mobile Relational Database**

#### **Authors**

Rebecca Bria and Kathryn E. DeTore

#### **Abstract**

In 2011, the Proyecto de Investigación Arqueológico Regional Ancash (PIARA) inaugurated an archaeological field school that employed a comprehensive digital data collection protocol. Students learned to record data on iPads using our customized relational databases for excavation, human skeletal analysis, and artifact classification. The databases integrated digital media, such as vector drawings and annotated photos. In a final research project, the students used the tablet system to analyze excavation contexts and artifacts, visualize relationships between the data, conduct literature reviews, and present their findings. This chapter discusses how students develop a greater comprehension of archaeological concepts and stronger research skills when they collect and analyze data using a relational database. More precisely, it argues that the database develops more perceptive archaeologists who can immediately recognize and interpret relationships between archaeological materials, contexts, and features. The technology, then, not only aids in-field planning and interpretation, but also cultivates analytical thinking.

#### **Authors Bios**

Rebecca Bria is an archaeologist with 15 years of field experience directing and collaborating on research projects in the Andes, Central America, the Mediterranean, the Middle East, and the United States. She has directed the PIARA field school since 2011, and is currently writing her Ph.D. dissertation at Vanderbilt University.

A self-proclaimed “tech nerd,” Kathryn DeTore is an archaeologist with five years of experience working in the Andes, Ireland, and the United States. Her association with PIARA started in 2009, which eventually led to her helping to design and implement the digital data collection protocol used by the project starting in the 2011 field season. Currently, Kathryn considers herself a retired archaeologist and enjoys spending time with her family while she plans her next career adventure.

### **1.7. Digital Pompeii: Dissolving the Fieldwork-Library Research Divide**

#### **Author**

Eric E. Poehler

#### **Abstract**

The advent of new forms of digital archaeological practice is revolutionizing the ways in which archaeologists work in the field. We have already witnessed the first part of the revolution, which has transformed archaeological methods of data collection and how such data are accessed and deployed in the field. In the second act of this revolution, published scholarship in digital form will be as easy to

implement in the field as the trowel, effectively (if theoretically) dissolving the spatio-temporal division between fieldwork and library work. This paper describes two examples of this dissolution of the fieldwork-library divide, one archival in nature (Pompeii Quadriporticus Project) and the other bibliographic (Pompeii Bibliography and Mapping Project). The brief discussion of each sets the stage for a more speculative foray into how such digital practices will transform archaeological practice in the coming decade.

### **Author Bio**

Eric E. Poehler is an Associate Professor at the University of Massachusetts, Amherst, specializing in Roman urbanism and digital archaeological practices, especially at Pompeii. He has published widely on aspects of Pompeii's urban infrastructure, including drainage, traffic, and pedestrian movement. Eric directs the Pompeii Bibliography and Mapping Project and co-directs the Pompeii Quadriporticus Project with Steven J. R. Ellis. Also with Ellis, Poehler works with the legacy data of the Panhellenic sanctuary at Isthmia, Greece, to reconstruct the site's history from previously excavated areas.

## **2.1. Reflections on Custom Mobile App Development for Archaeological Data Collection**

### **Author**

Samuel B. Fee

### **Abstract**

With the widespread adoption of tablet computers in 2010, archaeologists quickly began to envision new ways of completing traditional tasks. The technology seemed particularly well-suited for replacing the paper-and-pencil approach to data collection. In 2011, a custom mobile application—PKapp—was developed for the 2012 field season of the Pyla-Koutsopetria Archaeological Project in Cyprus. That application illuminated numerous possibilities for digital workflow in archaeological field research. Subsequently, mobile devices and software development tools have improved, making it easier to develop custom applications for data collection. Open-source HTML5 standards can ensure the software runs on any device regardless of platform, a robust selection of coding interfaces, libraries, and frameworks can speed up the development process and help avoid coding each line of the application by hand. This paper reflects upon the development of PKapp, considers the lessons learned, and describes how custom app development with open-source standards might be currently undertaken.

### **Author Bio**

Samuel B. Fee is Professor and Chair of Computing and Information Studies at Washington & Jefferson College. His research interests extend into the realms of computing, archaeology, visual communication, and digital media production. His work pursues answers to questions such as: How do we best learn and conduct research with technology? How does technology change human interaction? He has co-edited a volume with Brian R. Belland on computing and education entitled *The Role of Criticism in Understanding Problem Solving: Honoring the Work of John C. Belland* (Springer, 2012), as well as a forthcoming volume with Amanda M. Holland-Minkley and Thomas E. Lombardi, *New Directions for Computing Education: Embedding Computing Across Disciplines* (Springer, 2017). More information is available via his website at <http://samfee.net/>.

## **2.2. The Things We Can Do with Pictures: Image-Based Modeling and Archaeology**

### **Author**

Brandon R. Olson

### **Abstract**

Since the widespread availability of cost efficient image-based modeling software emerged five years ago, the discipline of archaeology has seen a proliferation of all things digital. The implementation of 3D modeling specifically is well attested as evidenced initially by a wave of peer-reviewed studies testing the technology for archaeological purposes, which has then been followed by colloquia, conferences panels, workshops, and publications focusing on the technology's analytical benefits. It remains evident that although digital archaeology is not a new development, it now has a heretofore unrepresented degree of staying power. The intention here is to present a critical analysis of the technology by drawing on a set of field applications that highlight how this technology continues to transform the discipline through a diverse set of methodological and interpretive frameworks.

### **Author Bio**

Brandon R. Olson (Ph.D., 2016, Boston University) is an affiliate faculty member in the History Department at Metropolitan State University in Denver, Colorado. His research interests include fluctuations in settlement and land use as a result of changing hegemonic powers and land use in the eastern Mediterranean during the Hellenistic and Roman eras. He seeks to harness the analytical qualities of GIS and 3D modeling in every stage of the archaeological process to identify, assess, and disseminate diachronic and episodic change in human settlement.

## **2.3. Beyond the Basemap: Multiscalar Survey through Aerial Photogrammetry in the Andes**

### **Authors**

Steven A. Wernke, Gabriela Oré, Carla Hernández, Aurelio Rodríguez, Abel Traslaviña, and Giancarlo Marcone

### **Abstract**

The revolutionary capabilities of digital aerial photogrammetry open new avenues for archaeological research design, cultural heritage management, and spatial visualization and analysis. The low cost and high speed of aerial photogrammetry democratize and accelerate both the production and distribution of high-resolution digital 2D and 3D spatial representations of archaeological features, sites, and landscapes. With cultural patrimony disappearing at alarming rates around the world, the adoption of these techniques is an urgent priority. We review our methods and experiences using 3D photogrammetric registry at several scales in the diverse environmental conditions of the Andean region, using an array of inexpensive aerial imagery capture platforms, including unmanned aerial vehicles (UAVs, or drones), meteorological balloons, and poles. The accuracy and resolution of the resulting products enable photogrammetric representations (e.g., orthomosaics, 3D solids, digital elevation models) to serve as the primary spatial references for survey and excavations. The methodological implications of these rapid advances have yet to be fully integrated into most archaeological research designs. Rather than using photogrammetry as a “value-added” technique appended to traditional survey or excavation, we outline workflows for rapid 3D photogrammetric documentation combined with mobile GIS. In sum, these transformative technologies and techniques enable the curation and broad dissemination of digital repositories of endangered cultural heritage, as well as dramatically richer spatial representations for an array of analytical ends in archaeological research.

## Author Bios

Steven A. Wernke is Associate Professor and Director of the Spatial Analysis Research Laboratory, Department of Anthropology, Vanderbilt University. His archaeological and ethnohistorical research focuses on themes of colonialism, community, landscape, and spatial analysis in the Andean region during late prehispanic and Spanish colonial times. His recent publications include *Negotiated Settlements: Andean Communities and Landscapes under Inka and Spanish Colonialism* (University Press of Florida, 2013), and “Capturing Complexity: Toward an Integrated Low-Altitude Photogrammetry and Mobile Geographic Information System Archaeological Registry System” (with Julie A. Adams and Eli R. Hooten), *Advances in Archaeological Practice* August 2014: 147–163.

Carla Hernández is a graduate student at Vanderbilt University and formerly a graduate student and lecturer in the Pontifical Catholic University of Peru. Her dissertation research focuses on issues of imperial expansion, negotiation, ritual, ethnohistory, and spatial analysis in the Central Andes. She has conducted research in different regions in the Peruvian highlands and coast. Most recently, she has directed the archaeological project “Lurin Highlands,” which addresses the interaction between the Inka Empire and the local polity in the province of Huarochirí in the central Peruvian highlands.

Giancarlo Marcone is General Coordinator of the Qhapaq Ñan Project of the Ministry of Culture, Peru. His research interests focus on how local people relate to expansive states, and his heritage management work centers on the development of collaborative, and diversity-inclusive management models for world heritage monuments. Marcone also teaches classes in archaeology, anthropology, heritage management in several Peruvian universities His recent publications include (with Enrique Lopez Hurtado, 2015) “Dual Strategies of the Rural Elites: Exploring the Intersection of Regional and Local Transformations in the Lurín Valley, Perú” *Latin American Antiquity* 26: 401–420”.

Gabriela Ore is a graduate student in the Department of Anthropology, Vanderbilt University. Her interests include spatial analysis, remote sensing applications in archaeology, and archaeometry, with a topical specialization in the late prehispanic and early colonial Andes. She holds a Masters degree in archaeology from Pontificia Universidad Católica del Perú. Currently, her research focuses on a forced resettlement program in early colonial Peru and its regional-scale impacts on agricultural and pastoral production and landscape dynamics.

Aurelio Rodriguez holds a Licenciante’s degree in archaeology from Pontificia Universidad Católica del Perú. His archaeological research and publications focus on the later prehispanic periods of the central coast of Peru. He is also a RC (Radio Crontról) pilot with over 37 years of experience building and flying RC aircraft, combines his enthusiasm for UAVs with archaeological research. In his workshop in Lima, he designs and builds UAVs and RC aircraft, and teaches RC piloting. He also has extensive experience in aerial photogrammetry and video.

Abel Traslaviña is a graduate student in archaeology at Universidad Nacional Mayor de San Marcos (Peru), and serves a research associate of the Instituto Riva-Agüero. His interests center on issues of place, the built environment, and landscape in the late prehispanic and Spanish colonial eras in the Andean region, with a methodological focus on GIS, photogrammetry, and other spatial technologies. His Licenciante’s thesis and recent publications (e.g., “Nuevas perspectivas sobre el diseño del espacio colonial rural: El caso de Nieve Nieve y Avillay en el valle de Lurín,” in press) address the general resettlement of Indians in colonial Peru.

## **2.4. An ASV (Autonomous Surface Vehicle) for Archaeology: The Pladypos at Caesarea Maritima, Israel**

### **Authors**

Bridget Buxton, Jacob Sharvit, Dror Planer, Mikoja Mišković, and John Hale

### **Abstract**

With the advent of new digital site recording technologies, archaeologists must manage spatial and visual datasets that have grown far beyond the capacity of last century's paper notebooks. Turning to purely digital recording systems ("going paperless") in underwater archaeology presents a different set of challenges from terrestrial archaeology and requires a specialized toolkit. The Pladypos prototype, an autonomous surface vehicle, responds to the need for underwater archaeological site mapping tools to be simple, robust, highly portable, and—where appropriate—to coordinate its operations effectively with human divers and tablet-based digital recording systems. Over several days in 2014, the Pladypos was deployed to map the Herodian port structures at Caesarea Maritima, Israel, one of the Mediterranean's most important submerged coastal sites. In 2015, this mission was expanded to support the excavation of the site of a possible 11th-century A.D. Fatimid shipwreck found near the southern breakwater of Caesarea's outer harbor.

### **Author Bios**

Bridget Buxton is an Associate Professor in the History Department at the University of Rhode Island. She holds degrees from Victoria University in Wellington, New Zealand, and a Ph.D. from the Graduate Group in Ancient History and Mediterranean Archaeology at the University of California, Berkeley. Her areas of specialization are underwater archaeology, and Hellenistic and Roman archaeology and civilization, especially regarding the Augustus age. Bridget has conducted fieldwork and led expeditions all around the Mediterranean, most recently in Israel with the Israel Antiquities Authority Maritime Unit. She collaborates with European and American colleagues to apply new robotic technologies in underwater archaeology.

Jacob Sharvit is the Director of the Underwater Archaeology Unit of the Israel Antiquities Authority. He has been working on land and underwater archaeology since 1988, including many excavations and surveys, and the management of the underwater and coastal archaeological heritage of Israel. His extensive publications include scientific articles, reports, and popular articles. He is member in the Israeli World Heritage Committee and was member of the Israeli delegation for the UNESCO convention on the protection of the underwater cultural heritage. He has participated in some European Union projects: Byzantium, STACHEM, etc. He has been a fully qualified commercial and technical diver for more than 30 years.

Dror Planer is an underwater archaeologist and technical diver with the Underwater Archaeology Unit of the Israel Antiquities Authority. Specializing in prehistory, he has participated in survey and excavation fieldwork and co-authored numerous publications on aspects of Israel's underwater archaeological heritage.

Nikola Mišković (M.Sc. 2005, Ph.D. 2010) is an Associate Professor at the University of Zagreb where he teaches control engineering-related courses. He is a project coordinator of H2020 EXCELLABUST-Excelling LABUST in Marine Robotics, FP7 CADDY - Cognitive Autonomous Diving Buddy and ONR-G projects related to marine robotics. He was also involved in FP7 CURE, FP7 CART, NATO-NURC collaboration project and is currently involved in FP7 EUROFLEETS2 project and H2020 subCULTron

project. He was a visiting researcher at Consiglio Nazionale delle Ricerche, ISSIA, Genova, Italy in 2008. He is a member of the IEEE Oceanic Engineering Society, the European Embedded Control Institute and the Association for Unmanned Vehicle Systems International. He is the author of two book chapters and more than sixty papers in journals and international conferences. His research interests include mathematical modelling, cooperative guidance, control and navigation of marine vessels (surface and underwater), nonlinear control theory and its applications in marine robotics.

John R. Hale received his Ph.D. from Cambridge in Archaeology. His archaeological fieldwork and research projects include studies of Bronze Age Scandinavian watercraft; prehistoric sites in the Ohio River Valley; the Roman villa of Torre de Palma in Portugal; development of a dating method for ancient mortar and concrete using AMS radiocarbon analysis; investigations of Greek oracle sites in Greece, Turkey, and Albania; a search for Phoenician harbors on the Portuguese coast; and deep-submergence surveys in quest of ancient shipwrecks in the Aegean Sea and the eastern Mediterranean. He has published in *Antiquity*, *Journal of Roman Archaeology*, *Scientific American*, and other journals; and his fieldwork has been featured in documentaries on the Discovery and History channels. He is currently Director of Liberal Studies at the University of Louisville.

### **3.1. Cástulo in the 21st Century: A Test Site for a New Digital Information System**

#### **Authors**

Marcelo Castro López, Francisco Arias de Haro, Libertad Serrano Lara, Ana L. Martínez Carrillo, Manuel Serrano Araque, and Justin Walsh

#### **Abstract**

The site of Cástulo, located near Linares (in the province of Jaén, Andalusia, Spain), was continuously occupied from prehistory through the sixteenth century c.e. The site offers a rich archaeological history, and it is currently under study by the Institute for Iberian Archaeological Research's interdisciplinary project, Forvm MMX. Wanting to incorporate traditional archaeological excavation and recording methods with new technology, the project created a new system of archaeological documentation, called Imilké. The system was created with several concepts in mind, including the immediate transmission of archaeological data from the site to a database and the ability to allow the simultaneous work of several teams. The tools used are simple: paper forms with a pattern of micro-dots; a microscanner in a digital pen that allows the device to recognize the field being completed in the database; a smartphone connected to the pen via Bluetooth to receive data; and a server/database connected via a data connection to the smartphone. By applying GIS to the information gathered in the Imilké system, it is possible to create 3D models of buildings and artifacts, which can be used by both researchers and the public to visualize the data collected during excavation.

#### **Author Bios**

Marcelo Castro López holds a Ph.D. in Archaeology from the University of Jaén. Since 2010 he has been director of the Archaeological Ensemble of Cástulo.

Francisco Arias de Haro has been a member of the Andalusian Cultural Institution Agency of Archaeological Ensemble of Cástulo since 2009.

Libertad Serrano Lara is a Ph.D. student at the University of Jaén where she has previously earned a MA in Archaeology.

Ana L. Martínez Carrillo holds a Ph.D. in Archaeology from the University of Jaén, and she has been a research assistant at the Institute for Iberian Archaeology.

Manuel Serrano Araque has a B.A. in Humanities, he has been a research assistant at Jaén's Institut Studies.

Justin St. P. Walsh holds a Ph.D. from the University of Virginia and is an Associate Professor in the School of Art at Chapman University. He is the director of the Chapman Excavations at Cástulo project. Justin has worked for more than a decade at archaeological sites across the Mediterranean, including Italy and Spain; he is the recipient of a Rome Prize, Fulbright Grant, and numerous other awards. He is the author of several articles on Greek pottery, cross-cultural interactions, and the protection of cultural heritage; he recently published *Consumerism in the Ancient World: Imports and Identity Construction* (Routledge, 2014).

### **3.2. Measure Twice, Cut Once: Cooperative Deployment of a Generalized, Archaeology-Specific Field Data Collection System**

#### **Authors**

Adela Sobotkova, Shawn A. Ross, Brian Ballsun-Stanton, Andrew Fairbairn, Jessica Thompson, Parker VanValkenburgh

#### **Abstract**

The Federated Archaeological Information Management Systems (FAIMS) Project is an Australian, university-based initiative developing a generalized, open-source mobile data collection platform that can be customized for diverse archaeological activities. Three field directors report their experiences adapting FAIMS software to projects in Turkey, Malawi, and Peru, highlighting three themes: (1) the transition from paper to digital recording has upfront costs with backend pay-off, (2) the transition involves decisions and tradeoffs that archaeologists and technologists need to make together, and (3) digital recording has both short- and long-term benefits. In the short-term, project directors reported efficient acquisition of richer, more accurate, data. Longer-term, they anticipated that the availability of comprehensive, born-digital datasets would support rigorous demonstration of field intuitions and faster publication of more complete datasets. We argue that cooperative development involving archaeologists and technologists can produce high-quality, fit-for-purpose software, representing the best chance to embedding new technology in established projects.

#### **Author Bios**

Adela Sobotkova (Ph.D., University of Michigan, 2012) is currently a Research Fellow at the School of Ancient History, Macquarie University in Sydney, Australia. Adela's research interests include the social complexity of Balkan and Black Sea indigenous communities during late prehistory, the methods of surface survey, and the application of spatial analysis and remote sensing to archaeology. She co-supervises the Tundzha Regional Archaeology Project (TRAP), a diachronic landscape archaeology project in Bulgaria, and serves as the Domain Expert for the Federated Archaeological Information Management Systems (FAIMS) Project.

Shawn Ross (Ph.D., University of Washington, 2001) is currently an Associate Professor of History and Archaeology and Deputy Director of the Big History Institute at Macquarie University in Sydney, Australia. Shawn's research interests include the history and archaeology of pre-Classical Greece, oral

tradition as history (especially Homer and Hesiod), the archaeology of the Balkans (especially Thrace), Greece in its wider Mediterranean and Balkan context, and the application of information technology to archaeology and the humanities more generally. He co-supervises the Tundzha Regional Archaeology Project (TRAP), a diachronic landscape archaeology project in Bulgaria, and directs the Federated Archaeological Information Management Systems (FAIMS) Project.

Brian Ballsun-Stanton received his Ph.D. from the University of New South Wales in 2012. He is currently a Research Associate at Macquarie University in Sydney, Australia. His research interests include exploring how people interact with and understand the nature of data and an investigation into the mechanics of ludic-narrative interactions in games. He is the Technical Director and Data Architect for the Federated Archaeological Information Management Systems (FAIMS) Project.

Andrew Fairbairn (Ph.D., University of London, 2001), is an Australian Research Council (ARC) Future Fellow at University of Queensland. He researches ancient agriculture, plant use and human environmental impact in Turkey, Italy (Pompeii), and Australasia via the analysis of archaeological plant remains (e.g., seeds, fruits, leaves), and he specializes in the study of plant macrofossil remains, such as seeds, fruits, leaves and wood, from archaeological sites to reconstruct past environments and economic practices. His research interests are currently focused on the origins of agriculture in Central Anatolia (Turkey) and the later development of the region's state economies. He also works in Australasia where he has been developing plant macrofossil techniques to disentangle ancient tree-fruit use and the development of food production in Papua New Guinea.

Jessica Thompson (Ph.D., Arizona State University, 2008), is an Assistant Professor at Emory University. She is a paleoanthropologist with research interests that target two key periods in human behavioral evolution: the origins of modern behavioural complexity during the Middle-to-Late Pleistocene and the origins of meat-eating and dietary change during the late Pliocene. Her work emphasizes the systematic collection of stone tool and fossil data at the landscape scale.

Parker VanValkenburgh (Ph.D., Harvard, 2012) is Assistant Professor of Anthropology at Brown University. His core research focuses on the political dimensions of landscapes, built environments, and human subjectivities. His primary current field project, the Proyecto Arqueológico Zaña Colonial (PAZC), has brought together settlement survey, spatial analysis, archival research, and household archaeology to examine the impact of Spanish colonial–forced resettlement on the indigenous populations of Peru in the 16th and 17th centuries A.D.

### **3.3. CSS for Success? Some Thoughts on Adapting the Browser-Based Archaeological Recording Kit (ARK) for Mobile Recording**

#### **Author**

J. Andrew Dufton

#### **Abstract**

The Archaeological Recording Kit (ARK) is an open-source system for flexible, web-based archaeological data management. As new advances in mobile technology have changed the way archaeologists think about data collection, ARK has evolved to meet the needs of on-site methodologies. This chapter outlines the history of ARK development and explores some possible trajectories for adaptation of the system to mobile workflows. Examples from the commercial sector, academic research, and public

outreach demonstrate the efficiency of customizing the Cascading Style Sheet (CSS) controlling ARK's web interface to facilitate tablet recording. Increasing global access to mobile broadband networks will make web-based recording systems such as ARK more convenient in the coming years, but this must also be accompanied by a change in archaeological practice encouraging open, online data not only as an afterthought to publication but as an active part of the fieldwork process.

#### **Author Bio**

J. Andrew Dufton is a doctoral candidate at the Joukowsky Institute for Archaeology and the Ancient World, Brown University. His research considers urbanism and urban processes in Iron Age and Roman North Africa, as well as the methodological implications of the uses of digital technologies for the dissemination of archaeological data and narratives.

### **3.4. The Development of the PaleoWay Digital Workflows in the Context of Archaeological Consulting**

#### **Authors**

Matthew Spigelman, Ted Roberts, and Shawn Fehrenbach

#### **Abstract**

PaleoWest Archaeology began to develop technology and methods for digital data collection in 2010, and quickly became the first archaeological consulting firm in the United State to adopt an all-digital workflow. The initial phase of research and development of this workflow coincided with a period of rapid software and hardware development, most notably the launch of the first- and second-generation iPads. The digital archaeological toolkit we assembled was used to collect survey data from tens of thousands of acres, document thousands of isolated artifacts, and record hundreds of archaeological sites throughout the American Southwest and elsewhere. This experience informed a second phase of development in which a custom database was constructed using FileMaker Pro. Ultimately, we developed a number of all-digital workflows that we refer to collectively as the PaleoWay. The development of this workflow has allowed us to collect better-quality data while becoming more efficient in our field and reporting operations.

#### **Author Bios**

Matthew Spigelman received his Ph.D. from New York University in 2015 while working as a consulting archaeologist in and around New York City. He has conducted fieldwork and museum research throughout the Eastern Mediterranean, with a focus on the island of Cyprus and ceramic technology and provenance. Matthew serves as a Project Manager in PaleoWest's New York Office, and in this capacity he has supervised projects throughout the northeastern United States.

Ted Roberts has 16 years of experience performing numerous archaeological investigations and cultural resource roles while employed in the private sector, the government, and academic institutions. Ted serves as the Principal in PaleoWest's New York Office, and he earned a M.A. in Anthropology from Northern Arizona University.

Shawn Fehrenbach has served with PaleoWest since 2010 in many roles, including Archaeologist, Project Director, Director of Graphics and GIS, and Chief Information Officer. He was appointed PaleoWest's COO in March of 2015. As head of operations, Shawn ensures PaleoWest's methods are on the cutting edge to enhance the efficiency and quality of our work products. Shawn directs PaleoWest's IT systems,

oversees the management and analysis of spatial and tabular datasets, and monitors training initiatives and project execution company-wide.

#### **4.1. Slow Archaeology: Technology, Efficiency, and Archaeological Work**

##### **Author**

William Caraher

##### **Abstract**

Slow archaeology situates contemporary, digital archaeological practice both in the historical tradition of the modern discipline of archaeology and within a discourse informed by calls for Taylorist efficiency. Rather than rejecting the use of digital tools, slow archaeology calls for archaeology to embrace a spirit of critical engagement with the rapidly changing technological landscape in the field. This contribution draws upon lessons from the popular "slow moment" and academic discussions of modernity and speed to consider the impact that the rapid adoption of digital tools has on archaeological practice and knowledge production. Slow archaeology pays particular attention to how digital tools fragment the process of archaeological documentation, potentially deskill fieldwork by relying on digital (Latourian) "blackbox" methods, and erode the sense of place so crucial to archaeological claims of provenience. The result of this critical attention to digital practices is neither a condemnation of new tools nor an unabashed celebration of their potential to transform the discipline, but a call to adopt new technologies and methods in a deliberate way that situates archaeological knowledge production in the realm of field practice.

##### **Author Bio**

William Caraher is an Associate Professor in History at the University of North Dakota. He received his Ph.D. at Ohio State University in Ancient History. He has directed archaeological projects in Cyprus and worked extensively in Greece. He is the co-director of the North Dakota Man Camp Project with Bret Weber and the co-author of *Pyla-Koutsopetria I: Archaeological Survey of An Ancient Coastal Town* (2014) with R. Scott Moore and David K. Pettegrew.

#### **4.2. Click Here to Save the Past**

##### **Author**

Eric C. Kansa

##### **Abstract**

This chapter owes much to the trenchant criticism of Internet utopianism offered by Evgeny Morozov in his influential book, *To Save Everything, Click Here* (2014). As such, this essay reflects on some issues in the social and professional context of digital archaeology that rarely see public discussion. Digital archaeology is profoundly shaped by an institutional landscape that demands the commoditization, marketing, and branding of scholarship "as a service." These forces make it extraordinarily difficult to sustain substantive and reflective intellectual engagement in our increasingly digitized discipline. As a strategy to overcome these issues, this contribution highlights why digital engagement requires much longer time scales in funding and greater professional commitment to recognizing the process and conduct of research rather than rewarding only the efficient production of measurable research outcomes.

### **Author Bio**

Eric Kansa (Ph.D., Harvard University) directs Open Context (<http://opencontext.org>), an open-access data publishing venue for archaeology referenced by both the National Science Foundation and the National Endowment for the Humanities for grant data management. Eric's research explores research data management, data reuse, and scholarly communications within the changing institutional and professional context of the digital humanities and social sciences. He also researches policy issues relating to intellectual property, including text-mining and cultural property concerns. Eric is also on the board of the Shelby White and Leon Levy Program for Archaeological Publications, a granting program that funds archaeological publications. In June 2013, the White House recognized Eric's contributions to promoting open access and reforming scholarly communications with a "Champion of Change" award. In 2016, the Archaeological Institute of America selected Open Context as the winner of their 2016 Award for Outstanding Work in Digital Archaeology.

### **5.1. Response: Living a Semi-digital Kinda Life**

#### **Author**

Morag M. Kersel

#### **Abstract**

The following observations draw on my personal experience as an archaeologist working in the Eastern Mediterranean who has dabbled in the digital world. In considering the papers in this volume, I reflect on what it means to "live a digital life" in field archaeology. I argue we are living a "semi-digital kinda life" (à la Third Eye Blind, the US rock band formed in the early 1990s) where many of us are part paper and part digital, which I contend is not a bad state of affairs. In assessing our half in/half out digital archaeology, I speculate that new technologies have the tendency to create, or reinforce, divisions between genders, developed and less-developed nations, and practice and theory. These thought-provoking chapters illustrate the very bright future for digital archaeological fieldwork and data collection, but there is still work to be done – to improve, expand, and include missing elements into digital archaeology.

#### **Author Bio**

Morag M. Kersel is Associate Professor of Anthropology at DePaul University and affiliated faculty with the Center for Art, Museum & Cultural Heritage Law in the College of Law at DePaul. Her work combines archaeological, archival, and ethnographic research in order to understand the efficacy of cultural heritage law in protecting archaeological landscapes from looting. She co-directs the Follow the Pots Project ([followthepotsproject.org](http://followthepotsproject.org)), which traces the movement of Early Bronze Age pots from the Dead Sea Plain in Jordan. Kersel earned her doctorate from the Department of Archaeology at the University of Cambridge and a Master of Historic Preservation from the University of Georgia. She recently co-authored (with Christina Luke) *U.S. Cultural Diplomacy and Archaeology: Soft Power, Hard Heritage* (Routledge 2013) and co-edited (with Matthew T. Rutz) *Archaeologies of Text: Archaeology, Technology and Ethics* (Oxbow 2014).

### **5.2. Response: Mobilizing (Ourselves) for a Critical Digital Archaeology**

#### **Author**

Adam Rabinowitz

## **Abstract**

Mobile platforms, paperless recording systems, and High Density Survey and Measurement techniques are a new frontier for archaeological documentation. But like all frontiers, the borderland at the intersection of the material and digital offers both opportunity and unexpected hazards. This response calls for a critical perspective on digital methods and approaches in archaeology, and examines the other contributions to the volume from three perspectives: celebratory, reflexive, and cautionary. These perspectives are framed within three manifestos that praise, ponder, or criticize the effects of new technologies—and the historical, social, or economic contexts of those technologies—on their users. The reader is urged to consider how the replacement of analogue with digital tools conditions knowledge production in the field of archaeology; how the dependency of archaeologists on the producers of digital tools affects possibilities for the long-term preservation and reuse of archaeological documentation; and what might happen when the language and framework of “disruption” and the “innovation cycle” is transferred to archaeological research. Two particular areas of inquiry are proposed for future research: embodied cognition, in terms of physical engagement with different tools; and the extension of mobile or wearable data collectors to the documentation of the practice and habits of the archaeologists themselves.

## **Author Bio**

Adam Rabinowitz is Associate Professor in the Department of Classics and Assistant Director of the Institute of Classical Archaeology at The University of Texas at Austin. He is an active field archaeologist and is involved with various projects related to the collection, management, and publication of digital archaeological data. His interest in the use of digital platforms for archaeological documentation and publication began during his work at the Roman site of Cosa in the 1990s and intensified in the course of excavations in the South Region of the Greek, Roman, and Byzantine site of Chersonesos in Crimea in the mid-2000s. In the course of his preparation of the South Region excavations for publication, he has also become involved with long-term archival preservation and the digital dissemination of rich contextual datasets. He is an active participant in efforts to build infrastructure for the sharing and integration of digital archaeological data, as an associate editor of the Pleiades gazetteer, as a member of the editorial board of Open Context, and as co-PI of the NEH- and IMLS-funded PeriodO project, which seeks to build a gazetteer of historical period definitions (<http://perio.do>).